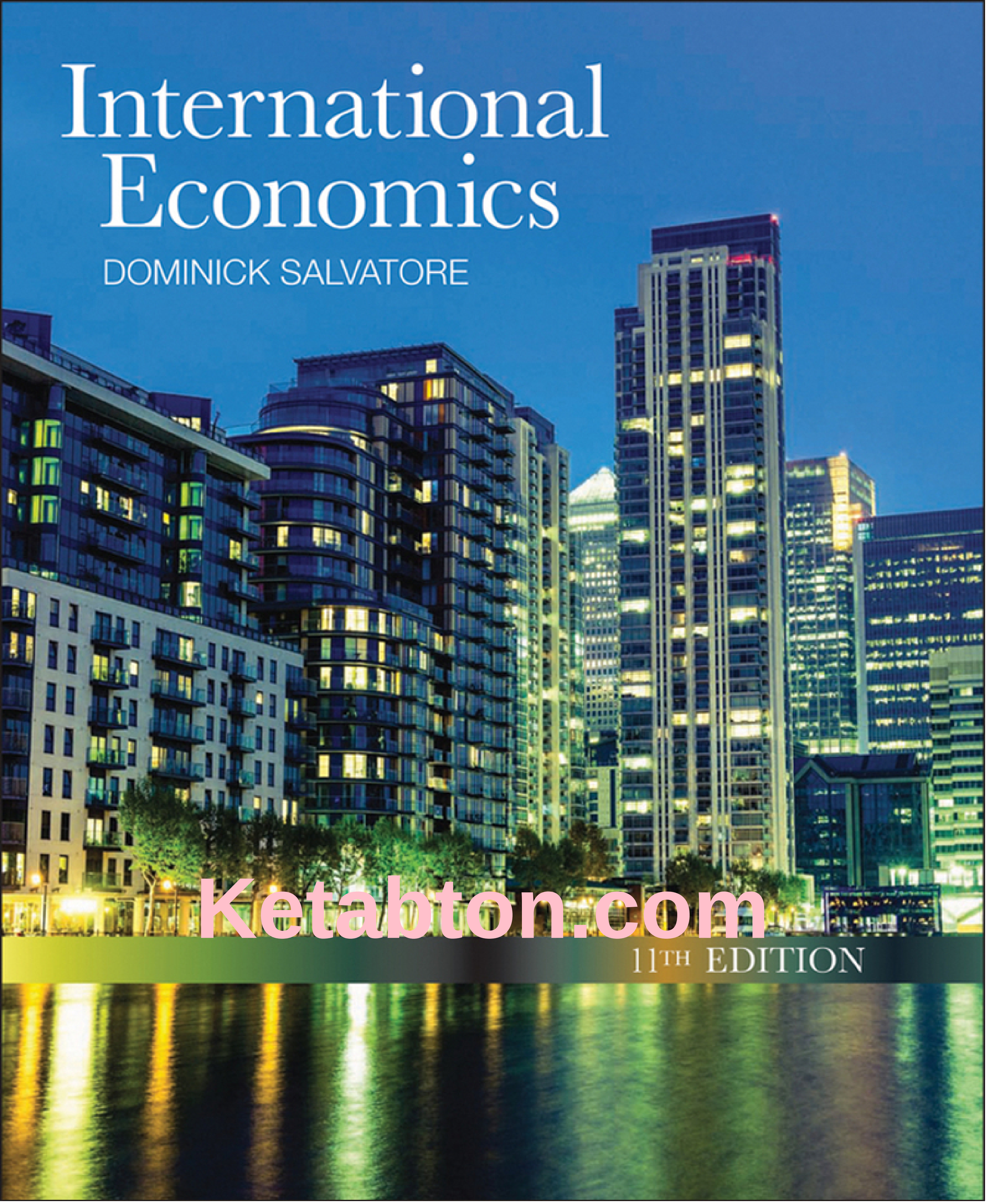
International Economics

DOMINICK SALVATORE



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Dominick Salvatore
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To Lucille

Preface

This is the eleventh edition of a text that has enjoyed a flattering market success, having been adopted by more than 600 colleges and universities throughout the United States, Canada, and other English-speaking countries and more than 1,000 in other countries around the world. The text has been translated into Chinese, French, Greek, Indonesian, Italian, Korean, Polish, Portuguese (Brazilian), Spanish, Russian, and other languages. All the features that have made the previous editions of this text one of the leading texts of International Economics in the United States and around the world have been retained in the eleventh edition. However, the content has been thoroughly updated and expanded to include many new significant topics and important recent developments.

Significant International Developments

The main objective of the eleventh edition of *International Ecconomics* is to present a comprehensive, up-to-date, and clear exposition of the theory and principles of international economics that are essential for understanding, evaluating, and suggesting solutions to the important international economic problems and issues facing the United States and the rest of the world today, and that countries are likely to face in the coming years. These are:

1. Slow growth and high unemployment in advanced economies after the "Great Recession"—the deepest financial and economic crisis since the Great Depression of 1929.
2. Rising protectionism in the United States and in other advanced countries in the context of a rapidly globalizing world reduces the level of specialization and trade, and it raises the specter of trade wars that would be very detrimental to the welfare of all nations.
3. Excessive volatility and large and persistent misalignments of exchange rates discourage the international flow of trade and investments and could lead to international financial and monetary crises.
4. Deep structural imbalances in the United States, slow growth in Europe and Japan, and insufficient restructuring in the transition economies of Central and Eastern Europe reduce the volume of international trade and could cause the collapse of the dollar and/or the euro.

5. The deep poverty in many developing countries and the widening international inequalities pose serious moral, political, and developmental problems for the United States and other advanced countries.

6. Resource scarcity, environmental degradation, and climate change put at risk continued growth in the United States and other advanced countries, as well as sustainable development in emerging markets.

These events significantly affect the well-being of the United States and the rest of the world but are, to a large extent, beyond U.S. control.

New to the Eleventh Edition

Chapter 1 has been thoroughly revised and updated to reflect the dramatic economic and financial changes that have taken place in the world economy since the last edition of this text. Section 1.6 has been thoroughly revised to identify the major international economic (trade and financial) problems facing the United States and the world today, and so has the discussion in Chapter 21 (Section 21.6), which examines how they can be resolved.

The rapid globalization of the world economy is providing major benefits to most countries, but it is also presenting many challenges to poor countries that are unable to take advantage of globalization, as well as to the United States and other advanced countries that face increasing competition from some emerging markets, especially China. These topics are discussed in several new sections and case studies in the trade and finance part of the text.

The dollar–euro exchange rate is as much in the news these days as the huge and unsustainable trade deficits of the United States and sovereign debts in the Eurozone. The relationship between U.S trade deficits, trade protectionism and misaligned exchange rates, as well as the crisis in the Euro Area are examined, both theoretically and empirically, and in all of their ramifications, in several trade and finance sections and case studies in this new edition of the text.

Besides their effect on international trade and international competitiveness, the continuing globalization of the world economy and liberalization of international capital markets have further eroded governments' control over national economic and financial matters. Exchange rates exhibit great volatility and large misalignments, both of which interfere with the flow of international trade and investments and distort the comparative advantage of nations. At the same time, international macroeconomic policy coordination has not progressed sufficiently to deal adequately with the potential problems and challenges that increased interdependence in world financial markets create.

The eleventh edition of this book also presents an in-depth analysis of the dangerous structural imbalances in the world economy and provides an evolution of the policy options available to deal with them. The major imbalances in the world economy today are the huge trade and budget (twin) deficits of the United States, the slow growth and high unemployment in Europe, the decade-long stagnation in Japan, the serious competitive challenge for both advanced and developing countries provided by the competition from China, the danger of financial and economic crises in emerging market economies, world poverty, resource scarcity, and environmental degradation. All of these topics are addressed in this edition of the text.

There are **122** case studies in the text. Many are new, and the others have been thoroughly revised.

The extended annotated Selected Bibliography at the end of each chapter has been thoroughly updated and extended, and it represents a major resource for further study and research on various topics.

The Internet section at the end of each chapter has been updated and expanded and gives the most important Internet site addresses or links to data sources, information, and analyses for the topics presented in each chapter to show how to access and use the wealth of information available on the Internet.

The Companion Web Site for the Text has also been thoroughly updated and expanded, and it presents for each chapter additional examples, cases, and theoretical points, as well as questions and problems that can be answered or solved using the Internet.

New, extended, and revised sections and case studies in the trade theory and policy parts of the text include benefits and challenges of globalization; the gravity model; the changing pattern of comparative advantage; variety gains from international trade; EU–US trade disputes and protectionism; the pervasiveness of nontariff trade barriers; strategic trade and industrial policies; the emergence of new economic giants; job losses in high U.S. import-competing industries; international trade and de-industrialization of the United States and other advanced countries; international trade and U.S. wage inequalities; benefits and costs of NAFTA; international trade and environmental sustainability; globalization and world poverty; trade and growth in developing countries; the collapse of the Doha Round; and the debate over U.S. immigration policy.

New sections and case studies in international finance include size, currency, and geographical distribution of the foreign exchange market; the carry trade; fundamental forces and "news" in exchange rate forecasting; the exploding U.S. trade deficit with China; the euro–dollar exchange rate defies forecasting; the Balassa–Samuelson effect in transition economies; structural imbalances and exchange rate misalignments; the effective exchange rate of the dollar and U.S. current account deficits; exchange-rate pass-through to import prices; petroleum prices and growth; inflation targeting and exchange rates; the global financial crisis and the Great Recession; slow recovery and growth after the Great Recession; the Eurozone crisis and the future of the euro; internationalization of the renminbi (yuan); exchange rate arrangements of IMF members; and reforms of the international monetary system.

More international trade and finance data are included throughout the text.

Audience and Level

The text presents all the principles and theories essential for a thorough understanding of international economics. It does so on an intuitive level in the text itself, and more rigorously in the appendices at the end of most chapters. In addition, partial equilibrium analysis is presented before the more difficult general equilibrium analysis (which is optional). Thus, the book is designed for flexibility. It also overcomes the shortcomings of other international economics texts in which the level of analysis is either too complicated or too simplistic.

Organization of the Book

The book is organized into four parts. Part One (Chapters 2–7) deals with trade theory (i.e., the basis and the gains from trade). Part Two (Chapters 8–12) deals with trade policy (i.e., obstructions to the flow of trade). Part Three (Chapter 13–15) deals with the measurement of a nation's balance of payments, foreign exchange markets, and exchange rate determination. Part Four (Chapters 16–21) examines open-economy macroeconomics or the macro relationships between the domestic economy and the rest of the world, as well as the operation of the present international monetary system.

In the typical one-semester undergraduate course in international economics, instructors may wish to cover the 11 core chapters (1, 2–3, 5, 9, 13–17, 21) as well as the few other asterisked sections in other chapters, and exclude the appendices. Undergraduate courses in international trade could cover Chapters 1 to 12 and 21, whereas undergraduate courses in international finance could cover Chapters 1 and 13 to 21. The many examples and real-world case studies presented also make the text very suitable for international economics courses in business programs. In first-year graduate courses in international economics and business, instructors may want to cover the appendices also and assign readings from the extensive annotated bibliography at the end of each chapter.

For the Student

- *The same example is utilized in all the chapters dealing with the same basic concept*. This feature is unique to this text. For example, the same graphical and numerical model is used in every chapter, from Chapters 2 through 11 (the chapters that deal with trade theory and policy). This greatly reduces the burden on the student, who does not have to start fresh with a new example each time. It also shows more clearly the relationship among the different topics examined.
- *Actual numbers are used in the examples and the graphs are presented on scales*. This makes the various concepts and theories presented more concrete, accessible, and pertinent to the student, and the graphs easier to read and understand.
- *There are **122 c**ase studies (from 4 to 9 per chapter)*. These real-world case studies are generally short and to the point and serve to reinforce understanding and highlight the most important topics presented in the chapter.
- *The sections of each chapter are numbered for easy reference*. Longer sections are broken into two or more numbered subsections. All of the graphs and diagrams are carefully explained in the text and then summarized briefly in the captions.
- *The judicious use of color and shading enhances the readability of the text and aids student understanding*.
- *Each chapter ends with the following teaching aids*:
  - **Summary**—A paragraph reviews each section of the text.
  - **A Look Ahead**—Describes what follows in the subsequent chapter.
  - **Key Terms**—Lists the important terms introduced in bold face type in the chapter. A glossary of all these terms is provided at the end of the book.
  - **Questions for Review**—Fourteen review questions are presented (two or more for each section in the chapter).
  - **Problems**—Fourteen to fifteen problems are provided for each chapter. These ask the student to calculate a specific measure or explain a particular event.

Brief answers to selected problems (those marked by an asterisk) are provided at www.wiley.com/college/salvatore for feedback.

- **Appendices**—These develop in a more rigorous but careful and clear fashion certain material that is presented on an intuitive level in the chapter.
- **Selected Bibliography**—The most important references are included, along with specific notes indicating the topic they cover. A separate Author Index is included at the end of the book.
- **Internet**—A section at the end of each chapter provides relevant Internet site addresses or links to data sources, information, and analyses to show the student how to access and use the wealth of information available on the Internet.

- *Accompanying the text, there are also*:
  - **A Web Site**—Each chapter presents additional examples, cases, and theoretical points and questions as well as problems that can be answered or solved using the Internet. The web site is continuously updated to reflect important new developments in the international economy as they unfold.
  - **An Online Study Guide** prepared by Professor Arthur Raymond of Muhlenberg College is available for students. This provides extensive review of key concepts, numerous additional illustrative examples, and practice problems and exercise sets.
  - **A Schaum Outline** on the *Theory and Problems of International Economics* (4th edition, 1996), prepared by the author, can be purchased at a very low price in most bookstores. This provides a problem-solving approach to the topics presented in the traditional way in this and other international economics texts.

For the Instructor

- **An Instructor's Manual** prepared by the author is available. It includes chapter objectives and lecture suggestions, answers to the end-of-chapter problems, a set of 15 to 20 multiple-choice questions, with answers, and additional problems and essays for each chapter.
- **PowerPoint Presentations**, prepared by Professor Leonie L. Stone of the State University of New York at Geneseo, provide brief outline notes of the chapter and also contain all the figures and tables in the text. These are available on the Instructor Companion Site.
- **A Test Bank**, also prepared by Professor Stone, contains at least 25 multiple-choice questions per chapter and is available on the Instructor Companion Site. A computerized version for easy test preparation is also available.

Acknowledgments

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Case Studies

chapter 1

Introduction

LEARNING GOALS:

After reading this chapter, you should be able to:

- Understand the meaning and importance of globalization
- Understand the relationship between international trade and the nation's standard of living
- Describe the subject matter (trade and monetary aspects) of international economics
- Identify the major international economic problems and challenges facing the United States and the world today

1.1 The Globalization of the World Economy

The world is rapidly globalizing and this is providing many opportunities and major challenges to the nations and people of the world. We begin our study of international economics with a brief overview of the globalization revolution taking place in the world today.

1.1A We Live in a Global Economy

We live in a globalized world. We can connect instantly with any corner of the world by cellular phone, e-mail, instant messaging, and teleconferencing, and we can travel anywhere incredibly fast. Tastes are converging (i.e., more and more people all over the world generally like the same things) and many goods we consume are either made abroad or have many imported parts and components. Many of the services we use are increasingly provided by foreigners as, for example, when a radiography taken in a New York hospital is evaluated across the world in Bangalore (India) and when H & R Block sends our tax returns abroad for processing. Even small companies that until a few decades ago faced only local or regional competition now must compete with firms from across the globe.

Although not as free as the flow of international trade in goods and services, millions of workers at all skill levels have migrated around the world, and thousands of jobs have moved from advanced countries to such emerging markets as India and China.

Finance has also globalized: We can invest in companies anywhere in the world and purchase financial instruments (stocks and bonds) from any company from almost anywhere in the world. Many pension funds are in fact invested abroad and a financial crisis in one financial center quickly spreads across the world at the click of a mouse. We can exchange dollars for euros and most other currencies easily and quickly, but the rates at which we exchange our currency often change frequently and drastically. In short, tastes, production, competition, labor markets, and financial markets are rapidly globalizing, and this affects all of us deeply as consumers, workers, investors, and voters—yes, we live in a global economy (see Case Studies 1-1 and 1-2).

CASE STUDY 1-1 The Dell PCs, iPhones, and iPads Sold in the United States Are Anything but American!

Headquartered in Round Rock, Texas, Dell coordinates a global production network in 34 countries in the Americas, Europe, and Asia. For most of the PCs sold in the United States, Dell performs only the final assembly domestically and relies on outside suppliers and contract manufacturers for components, peripherals, printed circuit board (PCB) assemblies, and subassemblies (box builds). The reason is that most parts and components are cheaper to produce in other parts of the world and are thus imported (see Table 1.1). Neither high-value components nor very low-value components (such as power supplies or keyboards) have to be made close to Dell's assembly plants. Only some midlevel components (such as motherboards and other PCB assemblies), which are too expensive to ship by air to meet volatility in demand, as well as to risk holding in inventory, are produced locally, but even that is not always the case.

In 2009, more than 90 percent of all the parts and components going into HP's PCs were made outside the United States. The components of an Apple iPhone are almost entirely Asian: the screen is from Japan, the flash memory is from Korea—and it was assembled in China! Apple contributed the design and software, and it integrated the innovations of others. The iPad introduced by Apple is made from parts and components by Samsung and L.G Display (Korean); Toshiba (Japanese); Broadcom (U.S.); Catcher Technologies, Wintek, Simplo Technology, and Novateck Microelectronics (Taiwan), and STMicroelectronics (Italy and France) and assembled in China. Less than 30 percent of the parts and components of the brand new Boeing 787 Dreamliner jet that went into service in 2011 are made in the United States.

TABLE 1.1. Locations and Companies That Supply Specific Parts and Components for Dell's PCs

Part/Component	Location	Company
Monitors	Europe and Asia	Phillips, Nokia, Samsung, Sony, Acer
PCBs	Asia, Scotland, and Eastern Europe	SCI, Celestica
Drives	Asia, mainly Singapore	Seagate, Maxtor, Western Digital
Printers	Europe (Barcelona)	Acer
Box builds	Asia and Eastern Europe	Hon Hai/Foxteq
Chassis	Asia and Ireland	Hon Hai/Foxteq

Sources: J. Dedrick and K. L. Kraemer, ''Dell Computer: Organization of a Global Production Network'' and ''Globalization of the Personal Computer Industry: Trends and Implications,'' *Working Paper*, Irvine, CA: Center for Research on Information Technology and Organizations (CRITO), University of California, Irvine, 2002; ''The Laptop Trail,'' *The Wall Street Journal*, June 9, 2005, p. 31; ''Rising in the East,'' *The Economist*, January 3, 2009, p. 47; http://www.ipadforums.net/apple-ipad-news/514-rumor-alert-ipad-release-date-likely-Friday-march-26th-2.html; and ''Dreamliner Production Gets Closer Monitoring.'' *The Wall Street Journal*, October 7, 2009, p. B1.

CASE STUDY 1-2 What Is an "American" Car?

Strange as it may seem, the question of what is an American car may be difficult to answer. Should a Honda Accord produced in Ohio be considered American? What about a Chrysler minivan produced in Canada (especially when Chrysler was owned by Germany's Daimler-Chrysler)? Is a Kentucky Toyota or Mazda that uses nearly 40 percent of imported Japanese parts American? Clearly, it is becoming more and more difficult to define what is American, and opinions differ widely.

For some, any vehicle assembled in North America (the United States, Canada, and Mexico) should be considered American because these vehicles use U.S.-made parts. But the United Auto Workers union views cars built in Canada and Mexico as taking away U.S. jobs. Some regard automobiles produced by Japanese-owned plants in the United States as American because they provide jobs for Americans. Others regard production by these Japanese "transplants" as foreign, because (1) the jobs they create were taken from the U.S. automakers, (2) they use nearly 40 percent imported Japanese parts, and (3) they remit profits to Japan. What if Japanese transplants increased their use of American parts to 75 percent or 90 percent? Was the Ford Probe, built for Ford by Mazda in Mazda's Michigan plant, American?

It is difficult to decide exactly what is an American car—even after the American Automobile Labeling Act of 1992, which requires all automobiles sold in the United States to indicate what percentage of the car's parts are domestic or foreign. One could even ask if this question is relevant at all in a world growing more and more interdependent and globalized. In order to be competitive, automakers must purchase parts and components wherever they are cheaper and better made, and they must sell automobiles throughout the world to achieve economies of mass production. Ford designs its automobiles in six nations (the United States, the United Kingdom, Germany, Italy, Japan, and Australia), has production facilities in 30 locations (3 in North America, 3 in South America, 7 in Asia, and 17 in Europe), and employs more workers outside than in the United States. In fact, the automotive and many other industries are rapidly moving toward a handful of truly global, independent companies.

Sources: "Honda's Nationality Proves Troublesome for Free-Trade Pact," *The New York Times*, October 9, 1992, p. 1; "What Is a U.S. Car? Read the Label," *The New York Times*, September 18, 1994, Section 3, p. 6; "Made in America? Not Exactly: Transplants Use Japanese Car Parts," *The Wall Street Journal*, September 1, 1995, p. A3B; "And Then There Were Five," *U.S. News & World Report*, March 4, 2000, p. 46; "What Is an American Car?" *The Wall Street Journal*, January 26, 2009, p. A5; and "One Ford for the Whole World," *Businessweek*, May 15, 2009, pp. 58–59.

1.1B The Globalization Challenge

Globalization is a revolution which in terms of scope and significance is comparable to the Industrial Revolution, but whereas the Industrial Revolution took place over a century, today's global revolution is taking place under our very eyes in a decade or two. Globalization, of course, is not new. Roman coins circulated throughout the empire two thousand years ago; Chinese currency was used in China even earlier. More recently, the world has experienced three periods of rapid globalization, 1870–1914, 1945–1980, and 1980 to the present.

Globalization in 1870–1914 resulted from the Industrial Revolution in Europe and the opening up of new, resource-rich, but sparsely populated lands in North America (the United States and Canada), South America (Argentina, Chile, and Uruguay), Australia and New

Zealand, and South Africa. These lands received millions of immigrants and vast amounts of foreign investments, principally from England, to open up new lands to food and raw material production. These so-called regions of recent settlement grew rapidly during this period by exporting increasing amounts of food and raw materials to Europe in exchange for manufactured goods. This period of modern globalization came to an end with the breakout of World War I in 1914.

The second period of rapid globalization started with the end of World War II in 1945 and extended to about 1980. It was characterized by the rapid increase of international trade as a result of the dismantling of the heavy trade protection that had been put in place during the Great Depression that started in the United States in 1929 and during World War II. What is different about the present globalization revolution (since 1980) is its speed, depth, and immediacy resulting from the tremendous improvements in telecommunications and transportation, massive international capital flows resulting from elimination of most restrictions on their flow across national boundaries, as well as by the participation of most countries of the world. This is what makes today's globalization that much more pervasive and dramatic than earlier periods of globalization. The recent (2008–2009) global financial and economic crisis, the deepest of the postwar period, only slowed down the march of globalization temporarily.

As all revolutions, however, today's globalization brings many benefits and advantages but also has some disadvantages or harmful side effects. In fact, there is a great deal of disagreement as to the extent and type of advantages and disadvantages. Does getting cheaper and/or better products and service from abroad justify sacrificing domestic jobs? Why are some people in some countries very rich and obese while others dismally poor and starving?

Although labor migration generally leads to the more efficient utilization of labor, it also leads to job losses and lower wages for less-skilled labor in advanced nations and harms (i.e., it is a "brain drain" for) the nations of emigration. Similarly, financial globalization and unrestricted capital flows lead to the more efficient use of capital throughout the world, as well as provide opportunities for higher returns and risk diversification for individuals and corporations. But they also seem to lead to periodic international financial crises, such as the ones that started in Asia in 1997 and affected most other developing countries, and the subprime housing mortgage crisis that started in the United States in 2007 and affected the entire world in 2008 and 2009. Finally, are we running out of resources such as petroleum, other minerals, water? Is the world headed for a climate disaster?

These disadvantages and negative aspects of globalization have given rise to a rethinking of the age-old belief in free trade and to a strong antiglobalization movement, which blames globalization for many human and environmental problems throughout the world, and for sacrificing human and environmental well-being to the corporate profits of multinationals. Globalization is being blamed for world poverty and child labor in poor countries, job losses and lower wages in rich countries, as well as environmental pollution and climate change throughout the world. Although there is some truth in these accusations, an in-depth economic analysis will show that often the primary cause of many of the serious problems facing the world today lies elsewhere (see Case Study 1-3).

Globalization has many social, political, legal, and ethical aspects, and so economists need to work closely with other social and physical scientists, as well as with the entire

CASE STUDY 1-3 Is India's Globalization Harming the United States?

The outsourcing of low-skilled service industry jobs (such as answering customer inquiries) from advanced countries to low-wage countries, such as India, reduces costs and prices in advanced countries, and it does not create much concern. In recent years, however, many high-skill and high-pay jobs in such diverse fields as computing and aircraft engineering, investment banking, and pharmaceutical research have been transferred to India and other emerging markets, creating great concern in advanced nations, especially the United States. Table 1.2 shows the outsourcing of high-tech services and jobs to India by some U.S. multinationals in 2008.

Companies such as IBM, Citigroup, and Morgan Stanley point out that outsourcing high-skill and high-wage jobs to India (and other emerging markets, especially China) where they can be done more cheaply keeps them internationally competitive, leads to lower prices for their products and services to American consumers, and is necessary for them to take advantage of fast-growing emerging markets. Transferring abroad many high-skill and high-paying jobs, as well as the crucial technologies on which they are based, however, inevitably causes great concern in the United States, not only for the loss of good U.S. jobs but also for the ability of the United States to remain the world's technological leader.

TABLE 1.2. Globalizing India

U.S. Company	Global Work Force	Work Force in India	Percentage in India	Outsourced Services
Accenture	146,000	27,000	18.5	By the end of 2008, the company had had more workers in India than in the United States
IBM	356,000	52,000	14.6	Independent development of software solutions for Indian and global clients
Citigroup	327,000	22,000	6.7	Analysis of U.S. stocks and evaluation of credit-worthiness of U.S. companies

Sources: ''India's Edge Goes Beyond Outsourcing,'' *The New York Times*, April 4, 2008, p. C1; ''IBM to Cut U.S. Jobs, Expand in India,'' *The Wall Street Journal*, March 26, 2009, p. B1; and ''Outsourced Forever,'' *Forbes*, September 26, 2011, pp. 38–39.

civil society, to give globalization a more human face (i.e., have all nations and people share its benefits). Globalization is important because it increases efficiency in the production of material things; it is inevitable because we cannot hide or run away from it. But we would like globalization also to be sustainable and humanizing and, ultimately, "fair." This requires a profound change in world governance. Such is the challenge facing humanity today and in this decade.

All these topics and many more are either directly or indirectly the subject matter of international economics that are covered in this text.

1.2 International Trade and the Nation's Standard of Living

The United States, stretching across a continent and rich in a variety of human and natural resources, can produce, relatively efficiently, most of the products it needs. Contrast this with the situation of small industrial countries, such as Switzerland or Austria, that have a few very specialized resources, and produce and export a much smaller range of products, and import all the rest. Even large industrial countries such as Japan, Germany, France, England, Italy, and Canada rely crucially on international trade. For developing nations, exports provide employment opportunities and earnings to pay for the many products that they cannot now produce at home and for the advanced technology that they need.

A rough measure of the economic relationship among nations, or their interdependence, is given by the ratio of their imports and exports of goods and services to their gross domestic product (GDP). The GDP refers to the total value of all goods and services produced in the nation in a year. Figure 1.1 shows that imports and exports as a percentage of GDP are much larger for smaller industrial and developing countries than they are for the United States. Thus, international trade is even more important to most other nations than it is to the United States.

Even though the United States relies to a relatively small extent on international trade, a great deal of its high standard of living depends on it. First of all, there are many commodities—coffee, bananas, cocoa, tea, scotch, cognac—that the country does not produce at all. In addition, the United States has no deposits of such minerals as tin, tungsten, and chromium, which are important to certain industrial processes, and it has only

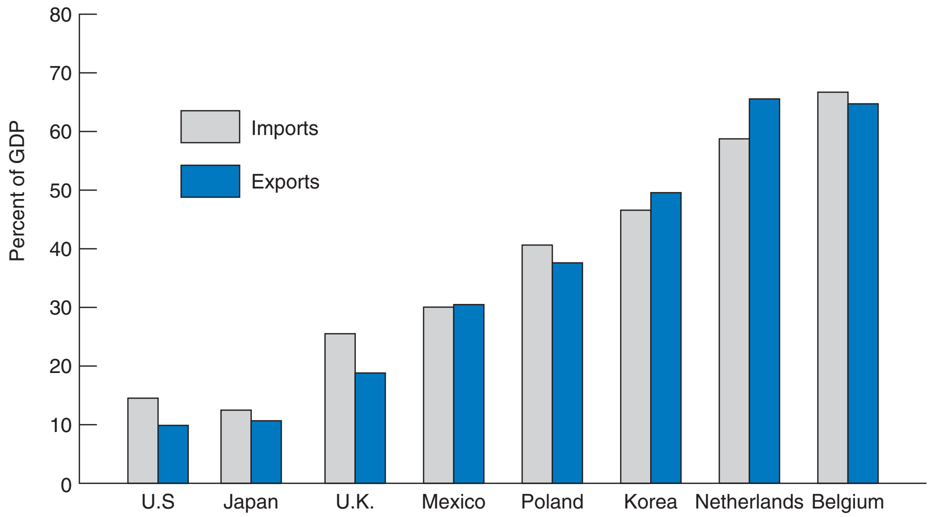

FIGURE 1.1. Imports and Exports as a Percentage of GDP in Various Countries in 2011. International trade (imports and exports) is even more important to most other smaller industrial and developing countries than it is to the United States.
Source: International Monetary Fund, *International Financial Statistics*, Washington, D.C.: IMF, July 2012.

dwindling reserves of petroleum, copper, and many other minerals. Much more important *quantitatively* for the nation's standard of living are the many products that could be produced domestically but only at a higher cost than abroad. We will see later that these account for most of the *benefits or gains from trade*.

Nevertheless, the United States could probably withdraw from world trade and still survive without too drastic a decline in its standard of living. The same cannot be said of such nations as Japan, Germany, England, or Italy—not to speak of Switzerland or Austria. Even Russia and China, which for political and military reasons have valued self-sufficiency very highly in the past, have now come to acknowledge their need to import high-technology products, foreign capital, and even grains, soybeans, and other agricultural commodities, and at the same time be able to export large quantities of their goods and services in order to pay for all the imports they need.

In general, the economic interdependence among nations has been increasing over the years, as measured by the more rapid growth of world trade than world production (see Figure 1.2). This has certainly been the case for the United States during the past four decades (see Case Study 1-4). The only exception to world trade rising, and rising faster than world GDP, were in 2001 and 2009. In 2001, world GDP rose slightly but world trade declined slightly (the first such decline since 1982–1983). To a large extent this was due to the economic recession in the United States in 2001 and the fear of terrorism following the September 11, 2001, attack on the World Trade Center in New York City and the Pentagon in Washington, D.C. International trade also declined in 2009 as a result of the deepest recession of the postwar period triggered by the world financial crisis. In all likelihood, trade will continue to serve as a strong stimulus to world growth in the future.

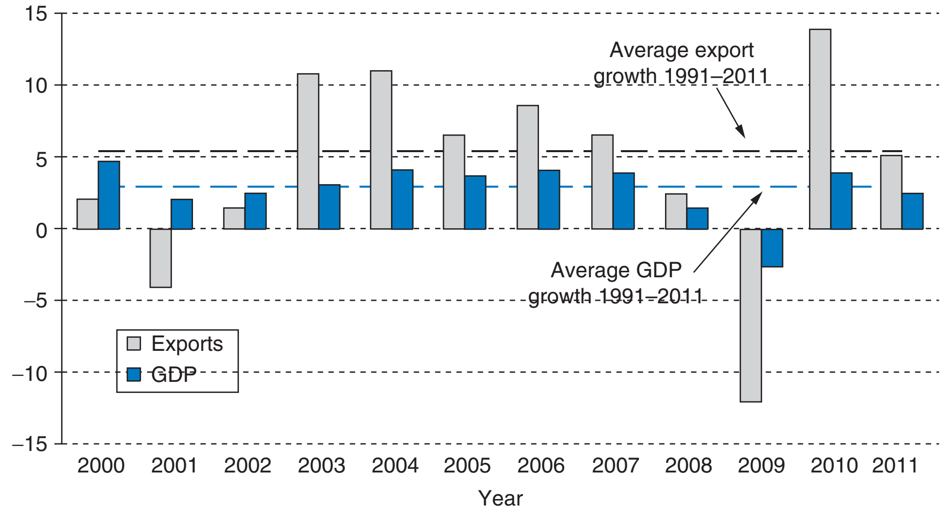

FIGURE 1.2. Growth of World Trade and GDP, 2000–2011 (annual percentage changes). International trade grew much faster than world production from 2000 to 2011, except in 2001 and 2009. *Source:* World Trade Organization, *World Trade Report*, Geneva: WTO, 2012, p. 18.

CASE STUDY 1-4 Rising Importance of International Trade to the United States

After remaining at between 4 and 5 percent during most of the 1960s, imports and exports of goods and services as percentages of gross domestic product (GDP) rose sharply in the United States during the 1970s. Figure 1.3 shows that imports as a percentage of U.S. GDP increased from about 5 percent during the late 1960s to more than 10 percent of GDP in 1980 and to a high of nearly 18 percent in 2008 before falling below 14 percent in 2009 as a result of the U.S. recession. Exports increased from about 5 percent in the late 1960s to about 10 percent in 1980 and to a high of nearly 13 percent of GDP in 2008, but it fell to 9.9 percent of GDP in 2011 because of recession or slow growth abroad. The figure shows that international trade has become more important to the United States (i.e., the United States has become more interdependent with the world economy) during the past four and one-half decades. Figure 1.3 also shows that the share of imports in GDP exceeded the share of exports since 1976 and the excess widened sharply during the first half of the 1980s and then again from 1996 to 2006. This led to huge U.S. trade deficits and persistent demands for protection of domestic markets and jobs against foreign competition by American industry and labor.

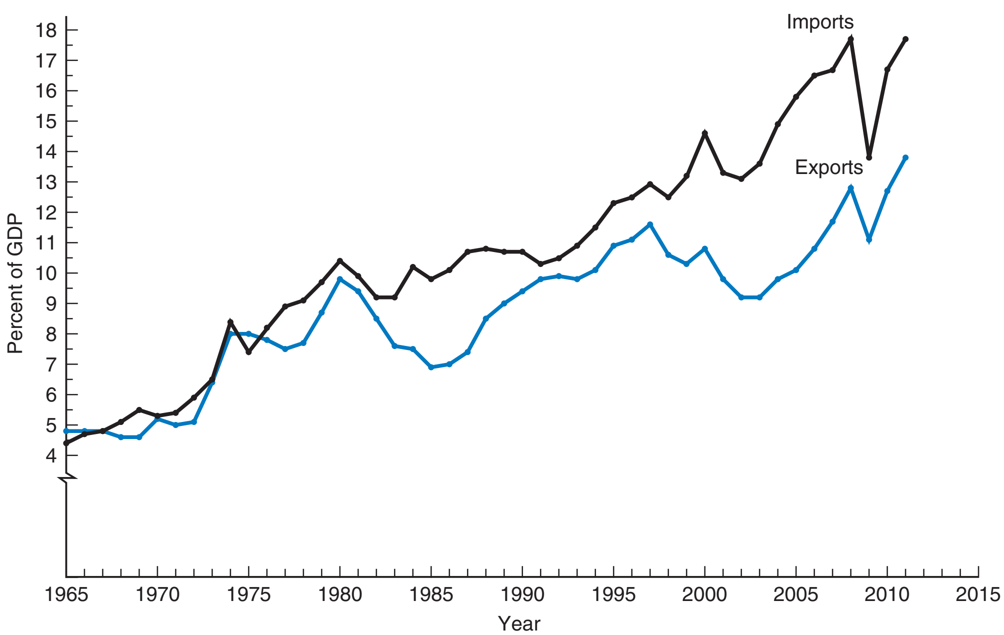

FIGURE 1.3. Imports and Exports as a Percentage of U.S. GDP, 1965–2011.
The share of imports and exports in U.S. GDP increased sharply since the early 1970s. Thus, international trade has become increasingly important to the United States. During the first half of the 1980s, and again from 1996 to 2006, U.S. imports greatly exceeded U.S. exports, resulting in huge trade deficits for the United States.
Source: International Monetary Fund, *International Financial Statistics Yearbook* (Washington, D.C., various issues).

But there are many other crucial ways in which nations are interdependent, so that economic events and policies in one nation significantly affect other nations (and vice versa). For example, if the United States stimulates its economy, part of the increased demand for goods and services by its citizens spills into imports, which stimulate the economies of other nations that export those commodities. On the other hand, an increase in interest rates in the United States is likely to attract funds (capital) from abroad and increase the international value of the dollar. This stimulates U.S. imports and discourages U.S. exports, thus dampening economic activity in the United States and stimulating it abroad.

Finally, trade negotiations that reduce trade barriers across nations may lead to an increase in the exports of high-technology goods (such as computers) and thus to an increase in employment and wages in those industries in the United States, but also to an increase in imports of shoes and textiles, thereby reducing employment and wages in those sectors. Thus, we see how closely linked, or interdependent, nations are in today's world and how government policies aimed at solving purely domestic problems can have significant international repercussions.

1.3 The International Flow of Goods, Services, Labor, and Capital

Interdependence in the world economy is reflected in the flow of goods, services, labor, and capital across national boundaries.

1.3A The International Flow of Goods and Services: The Gravity Model

We have seen that international trade is of growing importance to the nation's well-being. But which are the major U.S. trade partners and why? In general, we would expect nations to trade more with larger nations (i.e., with nations with larger GDPs) than with smaller ones, with nations that are geographically closer than with nations that are more distant (for which transportation costs would be greater), with nations with more open economic systems than with nations with less open systems, and with nations with similar language and cultural background than with nations that are more different.

In its simplest form, the gravity model postulates that (other things equal), the bilateral trade between two countries is proportional, or at least positively related, to the product of the two countries' GDPs and to be smaller the greater the distance between the two countries (just like in Newton's law of gravity in physics). That is, the larger (and the more equal in size) and the closer the two countries are, the larger the volume of trade between them is expected to be.

According to the gravity model, we expect the United States to trade more with its neighbors Canada and Mexico than with similar but more distant nations, and more with large economies such as China, Japan, and Germany than with smaller ones. This is exactly what Table 1.3 shows. That is, the largest trade partners of the United States are generally closer and/or larger. (The Appendix to this chapter provides detailed data on the commodity and geographic concentration of international trade, as well as on the world's leading exporters and importers of goods and services; Case Study 13-1 then gives the major commodity exports and imports of the United States.)

TABLE 1.3. The Major Trade Partners of the United States in 2011 (billions of dollars)

Country	Exports	Imports	Export Plus Imports
Canada	$282.3	$320.5	$602.8
China	105.3	400.6	505.9
Mexico	198.7	267.3	466.0
Japan	67.2	131.8	199.0
Germany	49.6	99.4	149.0
United Kingdom	57.0	51.9	108.9
South Korea	45.2	57.5	102.7
France	28.5	40.7	69.2
Taiwan	27.1	41.5	68.6
Italy	16.2	34.3	50.5

Source: U.S. Department of Commerce, *Survey of Current Business* (Washington, D.C.: U.S. Government Printing Office, July 2012), pp. 34–35.

1.3B The International Flow of Labor and Capital

Besides trade in goods and services, the international flow of people (migration) and capital across national boundaries is another measure or indicator of economic integration and globalization in the world economy.

Today there are about 190 million people in the world who live in a country other than the one in which they were born—nearly 60 percent of them are in rich countries (about 36 million in Europe and 38 million in the United States). People migrate primarily for economic reasons (i.e., to improve their standard of living and provide more opportunities for their children), but some do so to escape political and religious oppression. The 38 million foreign-born people who live in the United States represent 12.5 percent of the U.S. population and 16.2 percent of the American labor force. Of these, over 11 million, or nearly 30 percent, entered the nation illegally. Most nations impose restrictions on immigration to reduce the inflow of low-skilled people (while often encouraging the immigration of highly skilled and technical people). Migration is generally more restricted and regulated than the international flow of goods, services, and capital. (International labor migration is examined in detail in Section 12.6.)

In general, capital flows more freely across national boundaries than people. Financial or portfolio capital (bank loans and bonds) generally move to nations and markets where interest rates are higher, and foreign direct investments in plants and firms flows to nations where expected profits are higher. This leads to the more efficient use of capital and generally benefits both lenders and borrowers. During the 1970s, Middle Eastern nations deposited a great deal of their huge earnings from petroleum exports in New York and London banks, which then lent (recycled) them to Latin American and Asian governments and corporations. During the 1980s, Japan invested a large chunk of its huge export earnings in financial assets and real estate and to set up corporate subsidiaries in the United States.

Since the mid-1980s, the United States has become an increasingly large net borrower from the rest of the world to cover its excess of spending over production (see Case Study 1-5). Global banks established branches in major international monetary centers around the world (New York, London, Frankfurt, Tokyo, Shanghai, Singapore). More than $3 trillion (about 20 percent of the size of the U.S. GDP or economy) of foreign currencies

CASE STUDY 1-5 Major Net Exporters and Importers of Capital

Table 1.4 shows data on the major net exporters and importers of capital in 2011. Practically all nations export and import capital as their investors take advantage of foreign lending and investment opportunities, cover risk, and diversify their portfolios. Nations that export more capital than they import are the net capital exporters on the world scene, while those that import more capital than they export are the net capital importers. From the table we see that Germany and China are the largest net capital exporters, followed by Saudi Arabia and Japan. The United States, on the other hand, is by far the largest net capital importer. The United States is simply spending too much and living beyond its means—a situation that the United States needs to correct.

TABLE 1.4. Major Net Exporters and Importers of Capital in 2011

Net Exporters of Capital	Percent of World Capital Exports	Net Importers of Capital	Percent of World Capital Imports
Germany	12.8%	United States	38.5%
China	12.5	Turkey	6.3
Saudi Arabia	8.8	Italy	5.7
Japan	7.5	France	5.0
Russia	6.3	Spain	4.5
Switzerland	5.6	Brazil	4.3
Kuwait	4.6	Canada	4.0
Other	41.9	Other	31.7

Source: International Monetary Fund, *Global Financial Stability Report* (Washington, D.C.: IMF, April 2012), p. 3.

are exchanged each day by around-the-clock trading in world financial centers, and newly established sovereign funds (financial institutions owned by Middle Eastern petroleum exporting nations, Singapore, China, Russia, and Brazil) are making huge investments of all kinds all over the world. Financial markets are globalized as never before. The downside is that when a financial crisis starts in one country, it quickly spreads to others. (International capital flows are examined in detail in Chapter 12 and financial crises in Chapter 21.)

1.4 International Economic Theories and Policies

Let us now examine the purpose of international economic theories and policies and the subject matter of international economics.

1.4A Purpose of International Economic Theories and Policies

The purpose of economic theory in general is to predict and explain. That is, economic theory abstracts from the details surrounding an economic event in order to isolate the few variables and relationships deemed most important in predicting and explaining the event. Along these lines, international economic theory usually assumes a two-nation, two-commodity, and two-factor world. It further assumes no trade restrictions to begin with, perfect mobility of factors within the nations but no international mobility, perfect competition in all commodity and factor markets, and no transportation costs.

These assumptions may seem unduly restrictive. However, most of the conclusions reached on the basis of these simplifying assumptions hold even when they are relaxed to deal with a world of more than two nations, two commodities, and two factors, and with a world where there is some international mobility of factors, imperfect competition, transportation costs, and trade restrictions.

Starting with the simplifying assumptions just mentioned, international economic theory examines the basis for and the gains from trade, the reasons for and the effects of trade restrictions, policies directed at regulating the flows of international payments and receipts, and the effects of these policies on a nation's welfare and on the welfare of other nations. International economic theory also examines the effectiveness of macroeconomic policies under different types of international monetary arrangements or monetary systems.

Although most of international economics represents the application of general microeconomic and macroeconomic principles to the international context, many theoretical advances were made in the field of international economics itself, and only subsequently did they find their way into the body of general economic theory. One example is the so-called theory of the second best (discussed in Section 10.4A). Production and general equilibrium theory, growth theory, welfare economics, as well as many other economic theories, have also benefited from work in the international sphere. These contributions attest to the vitality and importance of international economics as a special branch of economics.

1.4B The Subject Matter of International Economics

International economics deals with the economic and financial interdependence among nations. It analyzes the flow of goods, services, payments, and monies between a nation and the rest of the world, the policies directed at regulating these flows, and their effect on the nation's welfare. This economic and financial interdependence is affected by, and in turn influences, the political, social, cultural, and military relations among nations.

Specifically, international economics deals with international trade theory, international trade policy, the balance of payments and foreign exchange markets, and open-economy macroeconomics. International trade theory analyzes the basis and the gains from trade. International trade policy examines the reasons for and the effects of trade restrictions. The balance of payments measures a nation's total receipts from and the total payments to the rest of the world, while foreign exchange markets are the institutional framework for the exchange of one national currency for others. Finally, open-economy macroeconomics deals with the mechanisms of adjustment in balance-of-payments disequilibria (deficits and surpluses). More importantly, it analyzes the relationship between the internal and the external sectors of the economy of a nation, and how they are interrelated or interdependent with the rest of the world economy under different international monetary systems.

International trade theory and policies are the microeconomic aspects of international economics because they deal with *individual* nations treated as single units and with the (relative) price of *individual* commodities. On the other hand, since the balance of payments deals with *total* receipts and payments, as well as with adjustment and other economic policies that affect the level of *national* income and the *general* price level of the nation as a whole, they represent the macroeconomic aspects of international economics. These are often referred to as open-economy macroeconomics or international finance.

International economic relations differ from interregional economic relations (i.e., the economic relations among different parts of the same nation), thus requiring somewhat different tools of analysis and justifying international economics as a distinct branch of economics. That is, nations usually impose some restrictions on the flow of goods, services, and factors across their borders, but not internally. In addition, international flows are to some extent hampered by differences in language, customs, and laws. Furthermore, international flows of goods, services, and resources give rise to payments and receipts in foreign currencies, which change in value over time.

International economics has enjoyed a long, continuous, and rich development over the past two centuries, with contributions from some of the world's most distinguished economists, from *Adam Smith* to *David Ricardo, John Stuart Mill, Alfred Marshall, John Maynard Keynes*, and *Paul Samuelson*. We will be examining the contribution made by each of these and other great economists in the following chapters. Other special branches of economics are of more recent vintage, and none can claim such a distinguished list of contributors and background.

1.5 Current International Economic Problems and Challenges

In this section, we briefly identify the most important international economic problems and challenges facing the world today. These are the problems that the study of international economic theories and policies can help us understand and evaluate suggestions for their resolution. The most serious economic problem in the world today is the slow growth and high unemployment facing the United States and most other advanced countries. On the trade side, the most serious problem is rising protectionism in advanced countries in the context of a rapidly globalizing world. On the monetary side are the excessive volatility of exchange rates (i.e., the very large fluctuations in the international value of national currencies) and their large and persistent misalignments (i.e., the fact that exchange rates can be far out of equilibrium for long periods of time). Other serious international economic problems are the deep structural imbalances in the United States, slow growth in Europe and Japan, and insufficient restructuring in the transition economies of Central and Eastern Europe; the deep poverty in many developing countries; and resource scarcity, environmental degradation, and climate change, and the danger they pose for continued growth and sustainable world development. A brief description of these problems and challenges follows.

1. *Slow Growth and High Unemployment in Advanced Economies after "the Great Recession"*
   In 2010 and 2011, advanced economies experienced slow growth and high unemployment as they came out of the most serious financial and economic crisis (often referred to as "the great recession") since the Great Depression of 1929. The 2008–2009 crisis started in the U.S. subprime (high-risk) housing mortgage market in August 2007 and then spread to the entire financial and real sectors of the U.S. economy in 2008, and from there to the rest of the world. The United States and other advanced nations responded by rescuing banks and other financial institutions from bankruptcy,

slashing interest rates and introducing huge economic stimulus packages. These efforts, however, only succeeded in preventing the economic recession from being deeper than otherwise. Even though the recession was officially over in 2010, slow growth and high unemployment remain the most serious economic problems facing most advanced nations. These problems are even greater for Greece, Ireland, Portugal, Spain and Italy (all members of the 17-nation European Monetary Union), which remain in deep crisis from overborrowing, unsustainable budget deficits, and loss of international competitiveness.

2. *Trade Protectionism in Advanced Countries in a Rapidly Globalizing World*
In the study of the pure theory of international trade in Part One (Chapters 2–7), we see that the best policy for the world as a whole is free trade. With free trade, each nation will specialize in the production of the commodities that it can produce most efficiently and, by exporting some of them, obtain more of other commodities than it could produce at home. In the real world, however, most nations impose some restrictions on the free flow of trade. Although invariably justified on national welfare grounds, trade restrictions are usually advocated by and greatly benefit a small minority of producers in the nation at the expense of the mostly silent majority of consumers. The problem is now exacerbated by the increasing competitive challenge that advanced countries face from the leading emerging market economies, particularly China and India. Widespread fears of large job losses have led to calls for protection from foreign competition in advanced countries, especially the United States. The challenge for advanced countries is how to remain competitive, avoid major job losses, share in the benefits of globalization, and avoid increased protectionism. How advanced countries can meet this challenge is examined in Part Two (Chapters 8–12) of the text.

3. *Excessive Fluctuations and Misalignment in Exchange Rates and Financial Crises*
In the study of international finance in Part Three (Chapters 13–15), we see that exchange rates have exhibited excessive fluctuations and volatility, as well as persistent misalignments or disequilibria. Periodic financial crises have also led to financial and economic instability and dampened growth in advanced and emerging markets alike—witness the financial crisis that started in Southeast Asia in 1997 and in the United States in 2007. These can disrupt the pattern of international trade and specialization and can lead to unstable international financial conditions throughout the world. They have also led to renewed calls for reforms of the present international monetary system and for more international coordination of economic policies among the leading economies (examined in Chapters 20 and 21 of the text).

4. *Structural Imbalances in Advanced Economies and Insufficient Restructuring in Transition Economies*
The United States faces deep structural imbalances in the form of excessive spending and inadequate national saving. This means that the United States is simply living beyond its means by borrowing excessively abroad. The result is huge capital inflows, an overvalued dollar, huge and unsustainable trade deficits, and unstable financial conditions. Europe faces inflexible labor markets and Japan serious inefficiencies in its distribution system, which slows their growth. Transition economies (the former communist countries of Central and Eastern Europe) require additional economic restructuring in order to establish full-fledged market economies and achieve more rapid growth. Inadequate growth in these areas dampens the growth of the entire

world economy and leads to calls for protectionism. Thus, we see how national and regional challenges quickly become global economic problems in our interdependent world. Part Four of the text (dealing with open-economy macroeconomics) examines the policies available to address these challenges.

5. *Deep Poverty in Many Developing Countries*
Even though many developing countries, especially China and India, have been growing very rapidly, some of the poorest developing nations, particularly those of sub-Saharan Africa, face deep poverty, unmanageable international debts, economic stagnation, and widening international inequalities in living standards. There are today more than 1 billion people (about one-sixth of the world population) who live on less than $1.25 a day! A world where millions of people starve each year not only is unacceptable from an ethical point of view but also can hardly be expected to be peaceful and tranquil. Chapters 11 and 21 will examine why international inequalities in standards of living between the rich and many of the poorest developing countries of the world are so large and widening, and what can be done to stimulate growth in the world's poorest countries.

6. *Resource Scarcity, Environmental Degradation, Climate Change, and Unsustainable Development*
Growth in rich countries and development in poor countries are now threatened by resource scarcity, environmental degradation, and climate change. In the face of rapidly growing demand, particularly by China and India, and supply rigidities in producing nations, the price of petroleum and other raw materials has risen sharply during the past few years, and so has the price of food. In many leading emerging market economies protection of the environment takes a backseat to the growth imperative. Environmental pollution is dramatic in some parts of China and the Amazon forest is rapidly being destroyed. And we are witnessing very dangerous climate changes that may have increasingly dramatic effects on life on earth. These problems can be only adequately analyzed and addressed by a joint effort of all the sciences together, a major worldwide cooperative effort, and a change in world governance.

1.6 Organization and Methodology of the Text

In this section, we briefly describe the organization, content, and methodology of this text.

1.6A Organization of the Text

This text is organized into four parts. Part One (Chapters 2–7) deals with international trade theory. It starts with the explanation of the important theory of comparative advantage in Chapter 2, examines the basis and the gains from trade in Chapter 3, and shows how equilibrium-relative prices are determined for internationally traded goods and services in Chapter 4. The Heckscher–Ohlin theory of international trade and its empirical relevance are examined in Chapter 5. Chapter 6 then discusses with new trade theories that base trade on economies of scale and imperfect competition. Chapter 7 deals with growth and trade.

Part Two (Chapters 8–12) focuses on international trade policies. Chapter 8 examines tariffs, the most important of the trade restrictions, while Chapter 9 extends the discussion to nontariff trade barriers, evaluates the justifications usually given for trade protectionism, and summarizes its history. Chapter 10 deals with economic integration among a group of countries, Chapter 11 examines the effects of international trade on economic development, and Chapter 12 discusses international resource movements and multinational corporations.

Part Three (Chapters 13–15) deals with the balance of payments, foreign exchange markets, and exchange rate determination. A clear grasp of these three chapters is crucial for understanding Part Four, which focuses on the adjustment to balance-of-payments disequilibria and open-economy macroeconomics. Chapter 13 discusses the measurement of a nation's balance of payments. Besides presenting the theory, Chapter 14 also examines the actual operation of foreign exchange markets and therefore is of great practical relevance to students of international economics, particularly business majors. Chapter 15 deals more closely with some of the monetary and financial determinants of exchange rates and the reason for exchange rate volatility.

Part Four (Chapters 16–21) examines the various mechanisms for adjusting balance-of-payments disequilibria, which are often referred to as open-economy macroeconomics. Chapter 16 covers the adjustment mechanism that operates by changing the relationship between domestic and foreign prices, while Chapter 17 examines the income adjustment mechanism and presents a synthesis of the automatic adjustment mechanisms. Chapters 18 and 19 focus on adjustment policies and open-economy macroeconomics proper. Chapter 20 compares fixed versus flexible exchange rates, examines the European Monetary System, and discusses international macroeconomic policy coordination. Finally, Chapter 21 examines the operation of the international monetary system over time, especially its present functioning, and it offers possible solutions for the major international economic challenges facing the world today.

The book starts at an abstract and theoretical level and then becomes more applied in nature and policy oriented. The reason is that one must understand the nature of the problem before seeking appropriate policies for its solution. Each part of the text starts with simple concepts and gradually and systematically proceeds to the more complex and difficult.

1.6B Methodology of the Text

This text presents all of the principles and theories for a thorough understanding of international economics. But it does so on an intuitive level in the text itself, while presenting more rigorous proofs requiring intermediate microeconomics and macroeconomics in the optional appendices at the end of most chapters. Thus, the book is designed to be useful to students of different academic backgrounds and provide a great deal of flexibility in the study of international economics. To make the concepts and theories presented more accessible and concrete, the same example is followed through in all chapters dealing with the same basic concept or theory, and actual numbers are used in examples. There is a shorter and simpler version of this text (*Introduction to International Economics*, 3rd ed., 2013, also by John Wiley & Sons) that I have published for students with only one or two principles of economics courses as background.

Besides the numerous examples and current events woven throughout the text to illustrate a theory or a point, from four to ten specific case studies are presented in each chapter of the text. These real-world case studies are generally short and to the point and serve to reinforce an understanding of and highlight the most important topics presented in the chapter.

Each chapter contains six or seven sections plus learning objectives, a summary, a look ahead, a list of important terms, questions for review, problems, one or more appendices, a selected bibliography, and NetLinks with Internet site addresses. Sections of each chapter are numbered for easy reference (as in this chapter). Long sections are broken down into two or more numbered subsections.

Each section of the chapter is summarized in one paragraph in the summary. Following the summary, a paragraph under the title of A Look Ahead tells what follows in the subsequent chapter. The purpose of this feature is to integrate the material more closely and show the relationship between the various chapters. Important terms are printed in color when they are first introduced and explained (as in this chapter); they are listed under Key Terms at the end of each chapter and are then collected with their definitions in the general Glossary at the end of the text.

There are from 12 to 14 questions for review and an equal number of problems for each chapter. The questions for review refer to the most important concepts covered in each chapter. The problems differ from the questions for review in that either they ask the student to analyze a current real-world international economic problem, or they ask the student to get a pencil and paper and draw a graph illustrating a particular theory or actually calculate a specific measure. These graphs and calculations are challenging but not tricky or time consuming. They are intended to show whether or not the student understands the material covered in the chapter to the point where he or she can use it to analyze similar problems. The student is urged to work through these problems because only with his or her active participation will international economics truly come alive.

The selected bibliography gives the most important references, clearly indicating the particular concept of the theory or application to which they refer, as well as the level of difficulty of each selection or groups of selections. INTERNet provides International Economics Internet site addresses or links with information on where to access additional information on the topics presented in each chapter. Answers to asterisked (*) problems are provided at www.wiley.com/college/salvatore.

SUMMARY

1. The world today is in the midst of a revolution based on the globalization of tastes, production, labor markets, and financial markets. Globalization is important because it increases efficiency; it is inevitable because international competition requires it. Globalization is being blamed for increased world income inequalities, child labor, environmental pollution, and other problems, and it has given rise to a strong anti-globalization movement.

2. The United States relies on international trade to obtain many products that it does not produce and some minerals of which it has no deposits or dwindling domestic reserves. More important *quantitatively* for the nation's standard of living are the many products that could be produced domestically but only at a higher cost than abroad. International trade is even more crucial to the well-being of other nations.

3. Interdependence in the world economy is reflected in the flow of goods, services, labor, and capital across national boundaries. The gravity model postulates that (other things equal), the bilateral trade between two countries is proportional or at least positively related to the product of the countries' GDPs. The greater the distance between the two countries, the smaller the GDPs. There are today about 190 million people in the world who live in a country other than the one in which they were born, about 38 million of which are in the United States. Huge amounts of capital (in the form of bank loans, bonds, and foreign direct investments in plants and firms) also move across national boundaries each year.

4. Starting with many simplifying assumptions, international economic theories examine the basis for and the gains from trade, the reasons for and the effects of trade restrictions, the policies directed at regulating the flow of international payments and receipts, and the effects of these policies on a nation's welfare. Thus, international economics deals with the pure theory of trade, the theory of commercial policy, the balance of payments and foreign exchange markets, and adjustment in the balance of payments or open-economy macroeconomics. The first two topics are the microeconomic aspects of international economics; the latter two are the macroeconomic aspects, also known as international finance.

5. The major international economic problems facing the world today are (1) slow growth and high unemployment in advanced nations after "the great recession," (2) the rise of trade protectionism in advanced countries in a rapidly globalizing world, (3) excessive vitatility and large disequilibria in exchange rates, (4) structural imbalances in advanced economies and insufficient restructuring in transition economies, (5) deep poverty in many developing countries, and (6) resource scarcity, environmental degradation, and climate change.

6. The book is organized into four parts. Part One (Chapters 2–7) deals with international trade theory. Part Two (Chapters 8–12) examines international trade policies. Part Three (Chapters 13–15) covers the balance of payments and foreign exchange markets. Part Four (Chapters 16–21) examines the various mechanisms to adjust balance-of-payments disequilibria and open-economy macroeconomics.

A LOOK AHEAD

In Chapter 2, we begin our presentation of the pure theory of international trade and present the law of comparative advantage. This is one of the most important and still unchallenged laws of economics, with many interesting and practical applications. The law of comparative advantage is the cornerstone of the pure theory of international trade, and it is crucial to master it completely before going on to other chapters.

KEY TERMS

Adjustment in balance of payments, p. 12
Antiglobalization movement, p. 4
Balance of payments, p. 12
Foreign exchange market, p. 12
Globalization, p. 3
Gravity model, p. 9
Interdependence, p. 6
International finance, p. 13
International trade policy, p. 12
International trade theory, p. 12
Macroeconomics, p. 13
Microeconomics, p. 12
Open-economy macroeconomics, p. 13

QUESTIONS FOR REVIEW

1. What is the meaning of globalization? What is its advantage and disadvantage? Why is there an anti-globalization movement?

2. What are some of the most important current events that are part of the general subject matter of international economics? Why are they important? How do they affect the economic and political relations between the United States and Europe? the United States and Japan?

3. How is international trade related to the standard of living of the United States? of other large industrial nations? of small industrial nations? of developing nations? For which of these groups of nations is international trade most crucial?

4. How can we get a rough measure of the interdependence of each nation with the rest of the world? What does the gravity model postulate?

5. What does international trade theory study? international trade policy? Why are they known as the microeconomic aspects of international economics?

6. What is the balance of payments, and what are foreign exchange markets? What is meant by adjustment in the balance of payments? Why are these topics known as the macroeconomic aspects of international economics? What is meant by open-economy macroeconomics and international finance?

7. What is the purpose of economic theory in general? of international economic theories and policies in particular?

8. What simplifying assumptions do we make in studying international economics? Why are these assumptions usually justified?

9. Why does the study of international economics usually begin with the presentation of international trade theory? Why must we discuss theories before examining policies? Which aspects of international economics are more abstract? Which are more applied in nature?

10. Which are the most important international economic challenges facing the world today? What are the benefits and criticisms of globalization?

11. From your previous course(s) in economics, do you recall the concepts of demand, supply, and equilibrium? Do you recall the meaning of the elasticity of demand? perfect competition? factor markets? the production frontier? the law of diminishing returns? the marginal productivity theory? (If you do not remember some of these concepts, quickly review them from your principles of economics text or class notes.)

12. From your previous course(s) in economics, do you recall the concepts of inflation, recession, growth? marginal propensity to consume, multiplier, accelerator? monetary policy, budget deficit, fiscal policy? (If you do not remember some of these concepts, quickly review them from your principles of economics text or class notes.)

PROBLEMS

1. Go through your daily newspaper and identify:

   (a) seven or eight news items of an international economic character;

   (b) the importance or effect of each of these problems on the U.S. economy;

   (c) the importance of each of these news items to you personally.

2. This question will involve you in measuring the economic interdependence of some nations.

   (a) Identify any five *industrial* nations not shown in Figure 1.1.

   (b) Go to your school library and find the latest edition of *International Financial Statistics* and construct a table showing the degree of economic interdependence for the nations you have chosen. Is the economic interdependence of the smaller nations greater than that of the larger nations?

3. Do the same as for Problem 2 for any five *developing* countries not shown in Figure 1.1.

4. Does the trade between the United States and Brazil and Argentina follow the prediction of the gravity model?

5. Take your principles of economics text (even if you have already had intermediate theory) and from the table of contents:

   (a) identify the topics presented in the microeconomics parts of the text;

   (b) compare the contents of the microeconomic parts of your principles text with the contents of Part One and Part Two of this text;

   (c) identify the topics presented in the macroeconomics parts of the text;

   (d) compare the contents of the macroeconomics parts of your principles text with the contents of Part Three and Part Four of this text.

***6.** **(a)** What does consumer demand theory predict will happen to the quantity demanded of a commodity if its price rises (for example, as a result of a tax) while everything else is held constant?

(b) What do you predict would happen to the quantity of imports of a commodity if its price to domestic consumers rose (for example, as a result of a tax on imports)?

***7.** **(a)** How can a government eliminate or reduce a budget deficit?

(b) How can a nation eliminate or reduce a balance-of-payments deficit?

8. **(a)** How do international economic relations differ from interregional economic relations?

(b) In what way are they similar?

9. How can we deduce that nations benefit from voluntarily engaging in international trade?

***10.** If nations gain from international trade, why do you think most of them impose some restrictions on the free flow of international trade?

11. Can you think of some ways by which a nation can gain at the expense of other nations from trade restrictions?

12. When the value of the U.S. dollar falls in relation to the currencies of other nations, what do you think will happen to the quantity of U.S.

(a) imports?

(b) exports?

* = Answer provided at www.wiley.com/college/salvatore.

APPENDIX

In this appendix, we present basic data on the commodity and geographic concentration of international trade, as well as on the world's leading exporters and importers of goods and services. We also provide sources of additional international data and information on current events.

A1.1 Basic International Trade Data

Table 1.5 shows the commodity composition of world merchandise (goods) trade in 2010. It shows that of the total world merchandise exports of $14,851 billion, $1,362 billion or 9.2 percent were in agricultural products (of which $1,119 billion or 7.5 percent were in food); $3,026 billion or 20.4 percent were in fuels and mining products (of which $2,349 billion or 15.8 percent were in fuels); and $9,962 billion or 67.1 percent were in manufactures (of which $5,082 billion or 34.2 percent were in machinery and transport equipment). Thus, 67.1 percent of total world merchandise exports were manufactures, 20.4 percent in fuels and mining products, and 9.2 percent in agricultural products.

Table 1.6 shows the geographic composition of world merchandise trade in 2010. It shows that of the total $15,237 billion world merchandise exports, $1,965 billion or 12.9 percent originated in North America (of which $1,278 billion or 8.4 percent in the United States, $388 billion or 2.5 percent in Canada, and $298 billion or 2.0 percent in Mexico); $577 billion or 3.8 percent originated in South and Central America (of which $202 billion or 1.3 percent in Brazil); $5,632 billion or 37.0 percent originated in Europe (of which $5,153 billion or 33.8 percent in the 27-country European Union); $588 billion or 3.9 percent came from the Commonwealth of Independent States or CIS (of which $400 billion or 2.6 percent from the Russian Federation); $508 billion or 3.3 percent originated in Africa (of which $81

TABLE 1.5. Commodity Composition of World Merchandise Trade, 2010 (billion dollars and percentage share of world total)

Category	Value of Exports	Percent of World Exports
Agricultural products	$1,362	9.2
Food	1,119	7.5
Raw materials	243	1.6
Fuels and mining products	3,026	20.4
Ores and other minerals	339	2.3
Fuels	2,349	15.8
Nonferrous metals	339	2.3
Manufactures	9,962	67.1
Iron and steel	421	2.8
Chemicals	1,705	11.5
Other semi-manufactures	941	6.3
Machinery and transport equipment	5,082	34.2
Office and telecom equipment	1,603	10.8
Automotive products	1,092	7.4
Other transport equipment	603	4.1
Other machinery	1,784	12.0
Textiles	251	1.7
Clothing	351	2.4
Other manufactures	1,211	8.2
Products not classified elsewhere	503	3.3
Total merchandise exports	14,851	100.0

Note: Some of the totals may not add up because of rounding
Source: World Trade Organization, *International Trade Statistics* (Geneva: WTO, 2011), Table A10.

billion or 0.5 percent from South Africa); $894 billion or 5.9 percent (mostly petroleum) originated in the Middle East (of which $250 billion or 1.6 percent from Saudi Arabia); and $5,072 billion or 33.3 percent came from Asia (of which $1,578 billion or 10.4 percent from China and $769 billion or 5.0 percent from Japan). Thus, Europe (and the European Union) and Asia were by far the world's largest exporters, followed by North America. The last two columns of Table 1.6 show the geographic distribution of world merchandise imports in 2010.

Table 1.7 shows the geographic destination of the merchandise exports of various regions in 2010. The first column of the table shows that 48.7 percent of the merchandise exports of North America went to North America (these are U.S. exports to Canada and Mexico, and Canadian and Mexican exports to the United States and to each other); 8.4 percent went to South and Central America; 16.8 percent went to Europe; 0.6 percent went to the Commonwealth of Independent States (CIS); 1.7 percent went to Africa; 2.7 percent to the Middle East; and 21.0 went to Asia. The second column of Table 1.7 shows that 25.6 percent of the merchandise exports of South and Central America went to other countries of South and Central America. The other main trade partners of South and Central America were North America, Asia, and Europe. The third column shows that almost three-quarters of European trade is within or intra-regional trade. As expected, Europe represents by far the largest trade partner of the Commonwealth of Independent States, as well as of Africa, while

TABLE 1.6. Geographical Composition of World Merchandise Trade, 2007 (billion dollars and percentage share of world total)

Region or Country	Value of Exports	Share (%)	Value of Imports	Share (%)
North America	$1,965	12.9	$2,683	17.4
United States	1,278	8.4	1,969	12.8
Canada	388	2.5	402	2.6
Mexico	298	2.0	311	2.0
South and Central America	577	3.8	578	3.8
Brazil	202	1.3	191	1.2
Europe	5,632	37.0	5,859	38.0
European Union (27)[a]	5,153	33.8	5,356	34.8
Excl. Intra-EU trade	1,788	11.7	1,991	12.9
Commonwealth Indep. States (CIS)[b]	588	3.9	414	2.7
Russian Federation	400	2.6	249	1.6
Africa	508	3.3	470	3.1
South Africa	81	0.5	94	0.6
Middle East	894	5.9	562	3.6
Saudi Arabia	250	1.6	97	0.6
Asia[c]	5,072	33.3	4,837	31.4
China	1,578	10.4	1,395	9.1
Japan	769	5.0	694	4.5
Other Asia	2,725	17.9	2,748	17.8
World[c]	15,237	100.0	15,402	100.0

[a] Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden, United Kingdom; Bulgaria, Cyprus, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Romania, Slovenia, and Slovak Republic.

[b] Armenia, Azerbaijan, Belarus, Georgia, Kazakhstan, Kyrgyz Republic, Moldova, Russian Federation, Tajikistan, Turkmenistan, Ukraine, and Ubzbekistan.

[c] Includes significant re-exports.

Note: The values may not add up to 100 because of incomplete coverage and rounding.

Source: World Trade Organization, *Annual Trade Statistics* (Geneva: WTO, 2011), Tables A6 and A7.

the Middle East exports (mostly petroleum) primarily to Asia. Inter-Asia trade represents 52.6 percent of the Asian merchandise exports, with most of the rest about equally destined to Europe and the United States.

Table 1.8 ranks the leading merchandise exporting and importing countries in 2010. The table shows that the world's top exporters and importers are the largest industrial countries and China, with China leading the list of the world exporters and the United States leading the list of the world importers. China moved very rapidly in the ranks of the largest world merchandise exporters and importers in recent years and now occupies first place in exports and second place after the United States in imports. Table 1.8 also shows that the leading exporters were also, for the most part, the leading importers.

Table 1.9 shows the world's leading exporting and importing countries of commercial services in 2010. The ranking is similar to that for merchandise trade, except for China, which is now fourth in exporting and third in importing. India ranks seventh among exporters

■ TABLE 1.7. Geographical Destination of Merchandise Exports, 2010 (percentages)

	North America	South & Central America	Europe	Commonwealth Independent States (CIS)[a]	Africa	Middle East	Asia	World
North America	48.7%	23.9%	7.4%	5.6%	16.8%	8.8%	17.1%	16.9%
South & Central America	8.4	25.6	1.7	1.1	2.7	0.8	3.2	4.0
Europe	16.8	18.7	71.0	52.4	36.2	12.1	17.2	39.4
Commonwealth Independent States (CIS)[a]	0.6	1.3	3.2	18.6	0.4	0.5	1.8	2.7
Africa	1.7	2.6	3.1	1.5	12.3	3.2	2.7	3.0
Middle East	2.7	2.6	3.0	3.3	3.7	10.0	4.2	3.8
Asia	21.0	23.2	9.3	14.9	24.1	52.6	52.6	28.4
World	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

[a]Armenia, Azerbaijan, Belarus, Georgia, Kazakhstan, Kyrgyz Republic, Moldova, Russian Federation, Tajikistan, Turkmenistan, Ukraine, and Ubzbekistan.
Note: The values may not add up to 100.0 percent because of incomplete coverage and rounding.
Source: World Trade Organization, *International Trade Statistics (Geneva: WTO, 2011),* Table 1.5.

■ TABLE 1.8. Leading Exporters and Importers of Merchandise, 2010 (billion dollars and percentage share of world total)

Exporters				Importers			
Rank	Country	Value	Share (%)	Rank	Country	Value	Share (%)
1	China	$1,578	10.4	1	United States	$1,969	12.8
2	United States	1,278	8.4	2	China	1,395	9.1
3	Germany	1,269	8.3	3	Germany	1,067	6.9
4	Japan	770	5.1	4	Japan	694	4.5
5	Netherlands	573	3.8	5	France	606	3.9
6	France	521	3.4	6	United Kingdom	560	3.6
7	Korea, Rep. of	466	3.1	7	Netherlands	517	3.4
8	Italy	448	2.9	8	Italy	484	3.1
9	Belgium	412	2.7	9	Korea, Rep. of	425	2.8
10	United Kingdom	406	2.7	10	Canada	402	2.6
Total of above		7,721	50.8	Total of above		8,119	52.7
World[a]		15,237	100.0	*World*[a]		15,402	100.0

[a]Includes significant re-exports.
Source: World Trade Organization, *International Trade Statistics, (Geneva WTO, 2011),* Table 1.8.

and importers of services. Note that trade in commercial services is now between one-quarter and one-fifth of merchandise trade and has been growing more rapidly than the latter as a reflection of the shift toward a service economy in most countries, especially the advanced countries and emerging markets.

TABLE 1.9. Leading Exporters and Importers of Commercial Services, 2010 (billion dollars and percentage share of world total)

Exporters				Importers			
Rank	Country	Value	Share (%)	Rank	Country	Value	Share (%)
1	United States	$518	14.0	1	United States	$358	10.2
2	Germany	232	6.3	2	Germany	260	7.4
3	United Kingdom	227	6.1	3	China	192	5.5
4	China	170	4.6	4	United Kingdom	161	4.6
5	France	143	3.9	5	Japan	156	4.4
6	Japan	139	3.8	6	France	129	3.7
7	India	123	3.3	7	India	116	3.3
8	Spain	123	3.3	8	Ireland	108	3.1
9	Netherlands	113	3.1	9	Italy	108	3.1
10	Singapore	112	3.0	10	Netherlands	106	3.0
Total of above		1,900	51.4	Total of above		1,694	48.3
World		3,695	100.0	World		3,510	100.0

Source: World Trade Organization, *Annual Trade Statistics*, (Geneva WTO, 2011), Table I.10.

A1.2 Sources of Additional International Data and Information

The most important sources for national and international trade and financial data, as well as for current events, are the following.

PUBLISHED BY THE UNITED STATES GOVERNMENT

Economic Report of the President (Washington, D.C.: U.S. Government Printing Office, annual) contains chapters on recent economic events, as well as time series data on the U.S. economy (including international trade and finance).

Federal Reserve Bulletin (Washington, D.C.: Board of Governors of the Federal Reserve System, monthly) includes a great deal of trade and financial information and data for the United States and other nations.

Statistical Abstract of the United States (Washington, D.C.: U.S. Department of Commerce, annual) includes a large amount of data on the United States, as well as comparative international statistics.

Survey of Current Business (Washington, D.C.: U.S. Department of Commerce, monthly) contains summary data on international trade by commodity group and geographic area, as well as other domestic and international data.

PUBLISHED BY INTERNATIONAL ORGANIZATIONS

Balance of Payments Statistics Yearbook. (Washington, D.C.: International Monetary Fund, annual) includes detailed balance of payments statistics on 165 countries.

Direction of Trade Statistics. (Washington, D.C.: International Monetary Fund, quarterly and annual) includes detailed data on the exports and imports of each of 159 countries to and from every other country of the world.

International Financial Statistics. (Washington, D.C.: International Monetary Fund, monthly and annual) includes a great variety of economic data on 194 countries.

International Trade Statistics. (Geneva: World Trade Organization, annual) gives trade data on each of 154 member countries and various groupings of nations.

Main Economic Indicators. (Paris: Organization for Economic Cooperation and Development, monthly and annual) includes a wide variety of economic data on the 34 member countries of OECD.

OECD Economic Outlook. (Paris: Organization for Economic Cooperation and Development, June and December of each year) contains analyses of recent events and OECD projections about future economic activity, as well as summary data tables on the 34 member countries and groups of countries.

World Economic Outlook. (Washington, D.C.: International Monetary Fund, April and October of each year) contains analyses of recent events and IMF projections about future economic activity, as well as summary data tables on the leading industrial countries and groups of countries.

World Development Report. (Oxford University Press, for the World Bank, annual) contains economic and social data for developing countries, as well as analysis of recent events and projections for the future.

CURRENT EVENTS SOURCES

Chicago Tribune (daily)

Financial Times (daily)

Los Angeles Times (daily)

New York Times (daily)

Wall Street Journal (daily)

Washington Post (daily)

Business Week (weekly)

The Economist (weekly)

Forbes (biweekly)

Fortune (biweekly)

Federal Reserve Bulletin (monthly)

IMF Survey Magazine (biweekly)

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INTERNet

The Internet site addresses for the International Monetary Fund (IMF), World Trade Organization (WTO), Organization for Economic Cooperation and Development (OECD), World Bank, and United Nations, which contain a wealth of trade and financial information and data (including the reports listed in the Selected Bibliography) are, respectively:

http://www.imf.org

http://www.wto.org

http://www.oecd.org

http://worldbank.org

http://unstats.un.org/unsd/economic_main.htm

For more information and data on the major commodity exports and imports of the United States and its major trade partners (as well as the reports indicated on the Selected Bibliography), see the Bureau of Census, the Bureau of Economic Analysis, and the Board of Governors of the Federal Reserve System, respectively, at:

http:census.gov/ftp/pub/foreign-trade/index.html

http://www.federalreserve.gov

The Economic Report of the President usually includes a chapter on international trade and finance. It is published in February of each year. The 2011 report is available at:

http://www.gpoaccess.gov/eop/2011/pdf/ERP-2011.pdf

The web site for the Institute for International Economics, which publishes many reports and analyses on international trade and international finance, is:

http://www.iie.com

For the gravity model, see:

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International Trade Theory

part 1

Part One (Chapters 2–7) deals with international trade theory. It starts with the explanation of the important theory of comparative advantage in Chapter 2, examines the basis for and the gains from trade in Chapter 3, and formalizes the discussion of how equilibrium relative prices are determined for internationally traded goods and services in Chapter 4. The Heckscher–Ohlin theory of international trade and results of empirical tests of the theory are presented in Chapter 5; Chapter 6 deals with important new and complementary trade theories, which base trade on economies of scale and imperfect competition; and Chapter 7 deals with the relationship between international trade and economic growth.

chapter 2

The Law of Comparative Advantage

LEARNING GOALS:

After reading this chapter, you should be able to:

- **Understand the law of comparative advantage**
- **Understand the relationship between opportunity costs and relative commodity prices**
- **Explain the basis for trade and show the gains from trade under constant costs conditions**

2.1 Introduction

In this chapter, we examine the development of trade theory from the seventeenth century through the first part of the twentieth century. This historical approach is useful not because we are interested in the history of economic thought as such, but because it is a convenient way of introducing the concepts and theories of international trade from the simple to the more complex and realistic.

The basic questions that we seek to answer in this chapter are:

1. What is the basis for trade and what are the gains from trade? Presumably (and as in the case of an individual), a nation will voluntarily engage in trade only if it benefits from trade. But how are gains from trade generated? How large are the gains and how are they divided among the trading nations?
2. What is the pattern of trade? That is, what commodities are traded and which commodities are exported and imported by each nation?

We begin with a brief discussion of the economic doctrines known as mercantilism that prevailed during the seventeenth and eighteenth centuries. We then go on to discuss the theory of absolute advantage, developed by Adam Smith. It remained, however, for David Ricardo, writing some 40 years after Smith, to truly explain the pattern of and the gains from trade with his law of comparative advantage. The law of comparative advantage is one of the most important laws of economics, with applicability to nations as well as to individuals and useful for exposing many serious fallacies in apparently logical reasoning.

One difficulty remained. Ricardo had based his explanation of the law of comparative advantage on the labor theory of value, which was subsequently rejected. In the first part of the twentieth century, Gottfried Haberler came to Ricardo's "rescue" by explaining the law of comparative advantage in terms of the opportunity cost theory, as reflected in production possibility frontiers, or transformation curves.

For simplicity, our discussion will initially refer to only two nations and two commodities. In the appendix to this chapter, the conclusions will be generalized to trade in more than two commodities and among more than two nations. It must also be pointed out that while comparative advantage is the cornerstone of international trade theory, trade can also be based on other reasons, such as economies of large-scale production and product differentiation. These are examined in Chapter 6. Furthermore, the comparative advantage of nations can change over time, especially as a result of technological change, as explained in Chapter 7.

2.2 The Mercantilists' Views on Trade

Economics as an organized science can be said to have originated with the publication in 1776 of *The Wealth of Nations* by Adam Smith. However, writings on international trade preceded this date in such countries as England, Spain, France, Portugal, and the Netherlands as they developed into modern national states. Specifically, during the seventeenth and eighteenth centuries a group of men (merchants, bankers, government officials, and even philosophers) wrote essays and pamphlets on international trade that advocated an economic philosophy known as mercantilism. Briefly, the mercantilists maintained that the way for a nation to become rich and powerful was to export more than it imported. The resulting export surplus would then be settled by an inflow of bullion, or precious metals, primarily gold and silver. The more gold and silver a nation had, the richer and more powerful it was. Thus, the government had to do all in its power to stimulate the nation's exports and discourage and restrict imports (particularly the import of luxury consumption goods). However, since all nations could not simultaneously have an export surplus and the amount of gold and silver was fixed at any particular point in time, one nation could gain only at the expense of other nations. The mercantilists thus preached economic nationalism, believing as they did that national interests were basically in conflict (see Case Study 2-1).

Note that the mercantilists measured the wealth of a nation by the stock of precious metals it possessed. In contrast, today we measure the wealth of a nation by its stock of human, man-made, and natural resources available for producing goods and services. The greater this stock of useful resources, the greater is the *flow* of goods and services to satisfy human wants, and the higher the standard of living in the nation.

At a more sophisticated level of analysis, there were more rational reasons for the mercantilists' desire for the accumulation of precious metals. This can be understood if it is remembered that the mercantilists were writing primarily for rulers and to enhance national power. With more gold, rulers could maintain larger and better armies and consolidate their power at home; improved armies and navies also made it possible for them to acquire more colonies. In addition, more gold meant more money (i.e., more gold coins) in circulation and greater business activity. Furthermore, by encouraging exports and restricting imports, the government would stimulate national output and employment.

CASE STUDY 2-1 Munn's Mercantilistic Views on Trade

Thomas Munn (1571–1641) was perhaps the most influential of the mercantilist writers, and his *England's Treasure by Foreign Trade* was the outstanding exposition of mercantilist thought on trade. Indeed, Adam Smith's attacks on mercantilist views on trade (see the next section) were directed primarily at Munn. Following is an excerpt from Munn's writing:

> *Although a Kingdom may be enriched by gifts received, or by purchase taken from some other Nations, yet these are things uncertain and of small consideration when they happen. The ordinary means therefore to encrease our wealth and treasure is by* Foreign Trade, *wherein we must ever observe this rule; to sell more to strangers yearly than we consume of theirs in value. For . . . that part of our stock [exports] which is not returned to us in wares [imports] must necessarily be brought home in treasure [bullion]. . . .*
>
> *We may . . . diminish our importations, if we would soberly refrain from excessive consumption of foreign wares in our diet and rayment [dress]. . . . In our exportations we must not only regard our superfluities, but also we must consider our neighbours necessities, that so . . . we may . . . gain so much of the manufacture as we can, and also endeavour to sell them dear, so far forth as the high price cause not a less vent in the quantity [of our exports]. But the superfluity of our commodities which strangers use, and may also have the same from other Nations, or may abate their vent by the use of some such like wares from other places, and with little inconvenience; we must in this case strive to sell as cheap as possible we can, rather than to lose the utterance [the sale] of such wares. . . .*

Source: Thomas Munn, *England's Treasure by Foreign Trade* (Reprinted, Oxford: Basil Blackwell, 1928). The words in brackets have been added to clarify the meaning.

In any event, mercantilists advocated strict government control of all economic activity and preached economic nationalism because they believed that a nation could gain in trade only at the expense of other nations (i.e., trade was a zero-sum game). These views are important for two reasons. First, the ideas of Adam Smith, David Ricardo, and other classical economists can best be understood if they are regarded as reactions to the mercantilists' views on trade and on the role of the government. Second, today there seems to be a resurgence of neo-mercantilism, as nations plagued by high levels of unemployment seek to restrict imports in an effort to stimulate domestic production and employment (this is examined in detail in Chapter 9). In fact, aside from England during the period 1815–1914, no Western nation has ever been completely free of mercantilist ideas (see Case Study 2-2).

CASE STUDY 2-2 Mercantilism Is Alive and Well in the Twenty-first Century

Although most nations claim to be in favor of free trade, most of them continue to impose many restrictions on international trade. Most industrial nations restrict imports of agricultural commodities, textiles, shoes, steel, and many other products in order to protect domestic employment. They also provide subsidies to some of their hi-tech industries, such as computers and telecommunications, deemed essential for the international competitiveness of the nation and its future growth. Developing countries are even more protective of domestic industries. As some forms of overt protection (such as tariffs and quotas) on some products have been reduced or eliminated over the years through

(continued)

CASE STUDY 2-2 Continued

multilateral negotiations, other less explicit types of protection (such as tax benefits and research and development subsidies) have been increased. This is evidenced by the numerous trade disputes that have arisen over time.

During the past few years, there have been disputes between the United States and the European Union (EU) on the latter's prohibition of U.S. beef exports from cattle raised with hormones; on the EU preferences for banana imports from African countries at the expense of bananas from Central American plantations (owned by American business interests); on EU subsidies to Airbus Industrie for the development of its new super-jumbo jet that takes sales away from Boeing's 747; on the tax rebates that the U.S. government was providing some exporters; and on the U.S. tariffs on imported steel. There are similarly many other trade disputes between the United States, Japan, other developed and developing countries, and among all these countries with one another. Indeed, the list of protected products is long and varied. Trade restrictions are demanded to protect domestic jobs from foreign competition and to encourage domestic high-tech industries—all classic mercantilist arguments. Mercantilism, though declining, is alive and well in the twenty-first century.

Sources: A. Krueger, "The Struggle to Convince the Free Trade Skeptics," *IMF Survey*, July 12, 2004, pp. 204–205; J. N. Bhagwati, *Free Trade Today* (Princeton, N.J.: Princeton University Press, 2002); D. A. Irwin, *Free Trade under Fire* (Princeton, N.J.: Princeton University Press, 2002); D. Salvatore, ed., *Protectionism and World Welfare* (New York: Cambridge University Press, 1993); and D. Salvatore, "The Challenges to the Liberal Trading System," *Journal of Policy Modeling,* July/August 2009, pp. 593–599.

2.3 Trade Based on Absolute Advantage: Adam Smith

Smith started with the simple truth that for two nations to trade with each other *voluntarily*, both nations must gain. If one nation gained nothing or lost, it would simply refuse to trade. But how does this *mutually beneficial* trade take place, and from where do these gains from trade come?

2.3A Absolute Advantage

According to Adam Smith, trade between two nations is based on absolute advantage. When one nation is more efficient than (or has an absolute advantage over) another in the production of one commodity but is less efficient than (or has an absolute disadvantage with respect to) the other nation in producing a second commodity, then both nations can gain by each *specializing* in the production of the commodity of its absolute advantage and exchanging part of its output with the other nation for the commodity of its absolute disadvantage. By this process, resources are utilized in the most efficient way and the output of *both* commodities will rise. This increase in the output of both commodities measures the gains from specialization in production available to be divided between the two nations through trade.

For example, because of climatic conditions, Canada is efficient in growing wheat but inefficient in growing bananas (hothouses would have to be used). On the other hand, Nicaragua is efficient in growing bananas but inefficient in growing wheat. Thus, Canada has an absolute advantage over Nicaragua in the cultivation of wheat but an absolute disadvantage in the cultivation of bananas. The opposite is true for Nicaragua.

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Under these circumstances, both nations would benefit if each specialized in the production of the commodity of its absolute advantage and then traded with the other nation. Canada would specialize in the production of wheat (i.e., produce more than needed domestically) and exchange some of it for (surplus) bananas grown in Nicaragua. As a result, both more wheat and more bananas would be grown and consumed, and both Canada and Nicaragua would gain.

In this respect, a nation behaves no differently from an individual who does not attempt to produce all the commodities she or he needs. Rather, the individual produces only that commodity that he or she can produce most efficiently and then exchanges part of the output for the other commodities she or he needs or wants. This way, total output and the welfare of all individuals are maximized.

Thus, while the mercantilists believed that one nation could gain only at the expense of another nation and advocated strict government control of all economic activity and trade, Adam Smith (and the other classical economists who followed him) believed that all nations would gain from free trade and strongly advocated a policy of laissez-faire (i.e., as little government interference with the economic system as possible). Free trade would cause world resources to be utilized most efficiently and would maximize world welfare. There were to be only a few exceptions to this policy of laissez-faire and free trade. One of these was the protection of industries important for national defense.

In view of this belief, it seems paradoxical that today most nations impose many restrictions on the free flow of international trade. Trade restrictions are invariably rationalized in terms of national welfare. In reality, trade restrictions are advocated by the few industries and their workers who are hurt by imports. As such, trade restrictions benefit the few at the expense of the many (who will have to pay higher prices for competing domestic goods). These issues will be examined in detail in Part Two.

Also to be noted is that Smith's theory served the interest of factory owners (who were able to pay lower wages because of cheaper food imports) and harmed landowners in England (because food became less scarce due to cheaper imports), and it shows the link between social pressures and the development of new economic theories to support them.

2.3B Illustration of Absolute Advantage

We will now look at a *numerical* example of absolute advantage that will serve to establish a frame of reference for presenting the more challenging theory of comparative advantage in the next section.

Table 2.1 shows that one hour of labor time produces six bushels of wheat in the United States but only one in the United Kingdom. On the other hand, one hour of labor time produces five yards of cloth in the United Kingdom but only four in the United States. Thus, the United States is more efficient than, or has an absolute advantage over, the United

TABLE 2.1. Absolute Advantage

	U.S.	U.K.
Wheat (bushels/hour)	6	1
Cloth (yards/hour)	4	5

Kingdom in the production of wheat, whereas the United Kingdom is more efficient than, or has an absolute advantage over, the United States in the production of cloth. With trade, the United States would specialize in the production of wheat and exchange part of it for British cloth. The opposite is true for the United Kingdom.

If the United States exchanges six bushels of wheat (6W) for six yards of British cloth (6C), the United States gains 2C or saves ½ hour or 30 minutes of labor time (since the United States can only exchange 6W for 4C domestically). Similarly, the 6W that the United Kingdom receives from the United States is equivalent to or would require six hours of labor time to produce in the United Kingdom. These same six hours can produce 30C in the United Kingdom (6 hours times 5 yards of cloth per hour). By being able to exchange 6C (requiring a little over one hour to produce in the United Kingdom) for 6W with the United States, the United Kingdom gains 24C, or saves almost five labor - hours.

The fact that the United Kingdom gains much more than the United States is not important at this time. What is important is that *both* nations can gain from specialization in production and trade. (We will see in Section 2.6B how the rate at which commodities are exchanged for one another is determined, and we will also examine the closely related question of how the gains from trade are divided among the trading nations.)

Absolute advantage, however, can explain only a very small part of world trade today, such as some of the trade between developed and developing countries. Most of world trade, especially trade among developed countries, could not be explained by absolute advantage. It remained for David Ricardo, with the law of comparative advantage, to truly explain the basis for and the gains from trade. Indeed, absolute advantage will be seen to be only a special case of the more general theory of comparative advantage.

2.4 Trade Based on Comparative Advantage: David Ricardo

In 1817, Ricardo published his *Principles of Political Economy and Taxation*, in which he presented the law of comparative advantage. This is one of the most important and still unchallenged laws of economics, with many practical applications. In this section, we will first define the law of comparative advantage; then we will restate it with a simple numerical example; finally, we will prove it by demonstrating that both nations can indeed gain by each specializing in the production and exportation of the commodity of its comparative advantage. In Section 2.6A, we will prove the law *graphically*.

2.4A The Law of Comparative Advantage

According to the law of comparative advantage, even if one nation is less efficient than (has an absolute disadvantage with respect to) the other nation in the production of *both* commodities, there is still a basis for mutually beneficial trade. The first nation should specialize in the production and export of the commodity in which its absolute disadvantage is smaller (this is the commodity of its *comparative advantage*) and import the commodity in which its absolute disadvantage is greater (this is the commodity of its *comparative disadvantage*).

TABLE 2.2. Comparative Advantage

	U.S.	U.K.
Wheat (bushels/hour)	6	1
Cloth (yards/hour)	4	2

The statement of the law can be clarified by looking at Table 2.2. The only difference between Tables 2.2 and 2.1 is that the United Kingdom now produces only two yards of cloth per hour instead of five. Thus, the United Kingdom now has an absolute disadvantage in the production of *both* wheat and cloth with respect to the United States.

However, since U.K. labor is half as productive in cloth but six times less productive in wheat with respect to the United States, *the United Kingdom has a comparative advantage in cloth*. On the other hand, the United States has an absolute advantage in both wheat and cloth with respect to the United Kingdom, but since its absolute advantage is greater in wheat (6:1) than in cloth (4:2), *the United States has a comparative advantage in wheat*. To summarize, the U.S. absolute advantage is greater in wheat, so its comparative advantage lies in wheat. The United Kingdom's absolute disadvantage is smaller in cloth, so its comparative advantage lies in cloth. According to the law of comparative advantage, both nations can gain if the United States specializes in the production of wheat and exports some of it in exchange for British cloth. (At the same time, the United Kingdom is specializing in the production and exporting of cloth.)

Note that in a two-nation, two-commodity world, once it is determined that one nation has a comparative advantage in one commodity, then the other nation *must* necessarily have a comparative advantage in the other commodity.

2.4B The Gains from Trade

So far, we have stated the law of comparative advantage in words and then restated it with a simple numerical example. However, we have not yet proved the law. To do so, we must be able to show that the United States and the United Kingdom can both gain by each specializing in the production and exporting of the commodity of its comparative advantage.

To start with, we know that the United States would be indifferent to trade if it received only 4C from the United Kingdom in exchange for 6W, since the United States can produce exactly 4C domestically by utilizing the resources released in giving up 6W (see Table 2.2). And the United States would certainly not trade if it received less than 4C for 6W. Similarly, the United Kingdom would be indifferent to trade if it had to give up 2C for each 1W it received from the United States, and it certainly would not trade if it had to give up more than 2C for 1W.

To show that both nations can gain, suppose the United States could exchange 6W for 6C with the United Kingdom. The United States would then gain 2C (or save ½ hour of labor time) since the United States could only exchange 6W for 4C domestically. To see that the United Kingdom would also gain, note that the 6W that the United Kingdom receives from the United States would require six hours to produce in the United Kingdom. The United

Kingdom could instead use these six hours to produce 12C and give up only 6C for 6W from the United States. Thus, the United Kingdom would gain 6C or save three hours of labor time. Once again, the fact that the United Kingdom gains more from trade than the United States is not important at this point. What is important is that both nations can gain from trade even if one of them (in this case the United Kingdom) is less efficient than the other in the production of both commodities.

We can convince ourselves of this by considering a simple example from everyday life. Suppose a lawyer can type twice as fast as his secretary. The lawyer then has an absolute advantage over his secretary in both the practice of law and typing. However, since the secretary cannot practice law without a law degree, the lawyer has a greater absolute advantage or a comparative advantage in law, and the secretary has a comparative advantage in typing. According to the law of comparative advantage, the lawyer should spend all of his time practicing law and let his secretary do the typing. For example, if the lawyer earns \$100 per hour practicing law and must pay his secretary \$10 per hour to do the typing, he would actually lose \$80 for each hour that he typed. The reason for this is that he would save \$20 (since he can type twice as fast as his secretary) but forgo earning \$100 in the practice of law.

Returning to the United States and the United Kingdom, we see that both nations would gain by exchanging 6W for 6C. However, this is not the only rate of exchange at which mutually beneficial trade can take place. Since the United States could exchange 6W for 4C domestically (in the sense that both require 1 hour to produce), the United States would gain if it could exchange 6W for more than 4C from the United Kingdom. On the other hand, in the United Kingdom 6W = 12C (in the sense that both require 6 hours to produce). Anything less than 12C that the United Kingdom must give up to obtain 6W from the United States represents a gain from trade for the United Kingdom. To summarize, the United States gains to the extent that it can exchange 6W for more than 4C from the United Kingdom. The United Kingdom gains to the extent that it can give up less than 12C for 6W from the United States. Thus, the range for mutually advantageous trade is

$$4C < 6W < 12C$$

The spread between 12C and 4C (i.e., 8C) represents the total gains from trade available to be shared by the two nations by trading 6W. For example, we have seen that when 6W are exchanged for 6C, the United States gains 2C and the United Kingdom 6C, making a total of 8C. The closer the rate of exchange is to 4C = 6W (the *domestic*, or *internal*, rate in the United States—see Table 2.2), the smaller is the share of the gain going to the United States and the larger is the share of the gain going to the United Kingdom. On the other hand, the closer the rate of exchange is to 6W = 12C (the domestic, or internal, rate in the United Kingdom), the greater is the gain of the United States relative to that of the United Kingdom.

For example, if the United States exchanged 6W for 8C with the United Kingdom, both nations would gain 4C, for a total gain of 8C. If the United States could exchange 6W for 10C, it would gain 6C and the United Kingdom only 2C. (Of course, the gains from trade are proportionately greater when more than 6W are traded.) In Section 2.6B, we will see how this rate of exchange is actually determined in the real world by demand as well as supply considerations. The rate of exchange will also determine how the total gains from trade are actually shared by the trading nations. Up to this point, all we have wanted to do is to prove that mutually beneficial trade can take place even if one nation is less efficient than the other in the production of both commodities.

So far, the gains from specialization in production and trade have been measured in terms of cloth. However, the gains from trade could also be measured exclusively in terms of wheat or, more realistically, in terms of both wheat and cloth. This will be done in the graphical presentation of the law of comparative advantage in Section 2.6A.

2.4C The Case of No Comparative Advantage

There is one (not very common) case where there is *no comparative advantage*. This occurs when the absolute disadvantage that one nation has with respect to another nation is the *same* in both commodities. For example, if one hour produced 3W instead of 1W in the United Kingdom (see Table 2.2), the United Kingdom would be exactly half as productive as the United States in both wheat and cloth. The United Kingdom (and the United States) would then have a comparative advantage in neither commodity, and no mutually beneficial trade could take place.

The reason for this is that (as earlier) the United States will trade only if it can exchange 6W for more than 4C. However, now the United Kingdom is not willing to give up more than 4C to obtain 6W from the United States because the United Kingdom can produce either 6W or 4C with two hours domestically. Under these circumstances, no mutually beneficial trade can take place.

This requires slightly modifying the statement of the law of comparative advantage to read as follows: Even if one nation has an absolute disadvantage with respect to the other nation in the production of both commodities, there is still a basis for mutually beneficial trade, *unless the absolute disadvantage (that one nation has with respect to the other nation) is in the same proportion for the two commodities*. Although it is important to note this case, its occurrence is rare and a matter of coincidence, so the applicability of the law of comparative advantage is not greatly affected. Furthermore, natural trade barriers such as transport costs can preclude trade even when some comparative advantage exists. At this point, however, we assume that no such natural or artificial (such as tariffs) barriers exist.

2.4D Comparative Advantage with Money

According to the law of comparative advantage (and disregarding the exception noted earlier), even if one nation (the United Kingdom in this case) has an absolute disadvantage in the production of both commodities with respect to the other nation (the United States), there is still a basis for mutually beneficial trade. But how, you may ask, can the United Kingdom export anything to the United States if it is less efficient than the United States in the production of both commodities? The answer is that wages in the United Kingdom will be sufficiently lower than wages in the United States so as to make the price of cloth (the commodity in which the United Kingdom has a comparative advantage) lower in the United Kingdom, and the price of wheat lower in the United States *when both commodities are expressed in terms of the currency of either nation*. Let us see how this works.

Suppose that the wage rate in the United States is \$6 per hour. Since one hour produces 6W in the United States (see Table 2.2), the price of a bushel of wheat is $P_W = \$1$. On the other hand, since one hour produces 4C, $P_C = \$1.50$ (from \$6/4C). Suppose that at the same time the wage rate in England is £1 per hour (the symbol "£" stands for pound, the U.K. currency). Since one hour produces 1W in the United Kingdom (see Table 2.2), $P_W = £1$ in the United Kingdom. Similarly, since one hour produces 2C, $P_C = £0.5$. If the exchange rate between the pound and the dollar is £1 = \$2, then $P_W = £1 = \$2$ and $P_C = £0.5 = \$1$ in the United Kingdom. Table 2.3 shows the dollar price of wheat and cloth in the United States and the United Kingdom at the exchange rate of £1 = \$2.

From Table 2.3 we can see that the dollar price of wheat (the commodity in which the United States has a comparative advantage) is lower in the United States than in the United Kingdom. On the other hand, the dollar price of cloth (the commodity in which the United Kingdom has a comparative advantage) is lower in the United Kingdom. (The result would be the same if the price of both commodities had been expressed in pounds.)

With the dollar price of wheat lower in the United States, businesspeople would buy wheat there and sell it in the United Kingdom, where they would buy cloth to sell in the United States. Even though U.K. labor is half as productive as U.S. labor in cloth production (see Table 2.2), U.K. labor receives only one-third of the U.S. wage rate (£1 = \$2 as opposed to \$6 in the United States), so that the dollar price of cloth is lower in the United Kingdom. To put it differently, the inefficiency of U.K. labor relative to U.S. labor in cloth production is more than compensated for by the lower wages in the United Kingdom. As a result, the dollar price of cloth is less in the United Kingdom, so the United Kingdom can export cloth to the United States. This is always the case as long as the U.K. wage rate is between ⅙ and ½ of the U.S. wage rate (the same as the productivity difference between the United Kingdom and the United States in the production of wheat and cloth).

If the exchange rate between the dollar and the pound were instead £1 = \$1 (so that the U.K. wage rate was exactly ⅙ the U.S. wage rate), then the dollar price of wheat in the United Kingdom would be $P_W = £1 = \$1$. Since this is the same price as in the United States (see Table 2.3), the United States could not export wheat to the United Kingdom at this exchange rate. At the same time, $P_C = £0.5 = \$0.50$ in the United Kingdom, and the United Kingdom would export even more cloth than before to the United States. Trade would be unbalanced in favor of the United Kingdom, and the exchange rate between the dollar and the pound (i.e., the dollar price of the pound) would have to rise.

On the other hand, if the exchange rate were £1 = \$3 (so that the U.K. wage rate was exactly ½ the U.S. wage rate), the price of cloth in the United Kingdom would be $P_C = £0.5 = \$1.50$ (the same as in the United States—see Table 2.3). As a result, the United Kingdom could not export cloth to the United States. Trade would be unbalanced in favor of the United States, and the exchange rate would have to fall. The rate of exchange between the dollar and the pound will eventually settle at the level that will result in balanced trade (in the absence of any interferences or other international transactions). We will return to this point in the appendix to this chapter and in much greater detail in Parts Three and Four, which deal with international finance.

TABLE 2.3. Dollar Price of Wheat and Cloth in the United States and United Kingdom at £1 = \$2

	U.S.	U.K.
Price of one bushel of wheat	\$1.00	\$2.00
Price of one yard of cloth	1.50	1.00

CASE STUDY 2-3 The Petition of the Candlemakers

Sometimes satire and ridicule are more effective than theory and logic in influencing public opinion. For example, exasperated by the spread of protectionism under the prevailing mercantilist philosophy of the time, French economist Frédéric Bastiat (1801–1851) overwhelmed the proponents of protectionism by satirically extending their arguments to their logical and absurd conclusions. Nowhere is this more brilliantly accomplished than in the fictitious petition of the French candlemakers, written by Bastiat in 1845, and excerpted here:

> *We are suffering from the intolerable competition of a foreign rival, placed, it would seem, in a condition so far superior to ours for the production of light, that he absolutely* inundates *our* national market *at a price fabulously reduced. The moment he shows himself, our trade leaves us—all of our consumers apply to him; and a branch of native industry, having countless ramifications, is all at once rendered completely stagnant. This rival . . . is not other than the sun.*
>
> *What we pray for is, that it may please you to pass a law ordering the shutting up of all windows, sky-lights, dormerwindows, curtains, blinds, bull's eyes; in a word all openings, holes, chinks, clefts, and fissures, by or through which the light of the sun has been in use to enter houses, to the prejudice of the meritorious manufactures with which we flatter ourselves we have accommodated our country,—a country which, in gratitude, ought not to abandon us now to a strife so unequal. . . .*
>
> *Does it not argue to the greatest inconsistency to check as you do the importation of coal, iron, cheese, and goods of foreign manufacture, merely because and even in proportion as their price approaches zero, while at the same time you freely admit, and without limitation, the light of the sun, whose price is during the whole day at* zero?
>
> *If you shut up as much as possible all access to natural light, and create a demand for artificial light, which of our French manufactures will not be encouraged by it? If more tallow is consumed, then there must be more oxen and sheep; and, consequently, we shall behold the multiplication of artificial meadows, meat, wool, hides, and above all, manure, which is the basis and foundation of all agricultural wealth.*

Source: Frédéric Bastiat, *Economic Sophisms* (Edinburgh: Oliver and Boyd, 1873), pp. 49–53, abridged.

Thus, the argument that could be advanced in the United States that it needs to protect the high wages and standard of living of its workers against cheap British labor is generally false. Similarly faulty is the opposing argument that could be advanced in the United Kingdom that its labor needs protection against more efficient U.S. labor. These arguments are certainly inconsistent, and both are basically false (see Case Study 2-3).

2.5 Comparative Advantage and Opportunity Costs

Ricardo based his law of comparative advantage on a number of simplifying assumptions: (1) only two nations and two commodities, (2) free trade, (3) perfect mobility of labor within each nation but immobility between the two nations, (4) constant costs of production, (5) no transportation costs, (6) no technical change, and (7) the labor theory of value. Although assumptions one through six can easily be relaxed, assumption seven (i.e., that the labor theory of value holds) is not valid and should not be used for *explaining* comparative advantage.

2.5A Comparative Advantage and the Labor Theory of Value

Under the labor theory of value, the value or price of a commodity depends exclusively on the amount of labor going into the production of the commodity. This implies (1) that either labor is the only factor of production or labor is used in the *same* fixed proportion in the production of all commodities and (2) that labor is homogeneous (i.e., of only one type). Since neither of these assumptions is true, we cannot base the explanation of comparative advantage on the labor theory of value.

Specifically, labor is not the only factor of production, nor is it used in the same fixed proportion in the production of all commodities. For example, much more capital equipment per worker is required to produce some products (such as steel) than to produce other products (such as textiles). In addition, there is usually some possibility of substitution between labor, capital, and other factors in the production of most commodities. Furthermore, labor is obviously not homogeneous but varies greatly in training, productivity, and wages. At the very least, we should allow for different productivities of labor. Indeed, this is how the Ricardian theory of comparative advantage has been tested empirically (see Section 2.7). In any event, the theory of comparative advantage need not be based on the labor theory of value but can be explained on the basis of the opportunity cost theory (which is acceptable). To be noted is that Ricardo himself did not believe in the labor theory of value and used it only as a simple way to explain the law of comparative advantage.

2.5B The Opportunity Cost Theory

It was left for Haberler in 1936 to explain or base the theory of comparative advantage on the opportunity cost theory. In this form, the law of comparative advantage is sometimes referred to as the *law of comparative cost*.

According to the opportunity cost theory, the cost of a commodity is the amount of a second commodity that must be given up to release just enough resources to produce one additional unit of the first commodity. No assumption is made here that labor is the only factor of production or that labor is homogeneous. Nor is it assumed that the cost or price of a commodity depends on or can be inferred exclusively from its labor content. Consequently, the nation with the lower opportunity cost in the production of a commodity has a comparative advantage in that commodity (and a comparative disadvantage in the second commodity).

For example, if in the absence of trade the United States must give up two-thirds of a unit of cloth to release just enough resources to produce one additional unit of wheat domestically, then *the opportunity cost of wheat is two-thirds of a unit of cloth* (i.e., $1W = \frac{2}{3}C$ in the United States). If $1W = 2C$ in the United Kingdom, then the opportunity cost of wheat (in terms of the amount of cloth that must be given up) is lower in the United States than in the United Kingdom, and the United States would have a comparative (cost) advantage over the United Kingdom in wheat. In a two-nation, two-commodity world, the United Kingdom would then have a comparative advantage in cloth.

According to the law of comparative advantage, the United States should specialize in producing wheat and export some of it in exchange for British cloth. This is exactly what we concluded earlier with the law of comparative advantage based on the labor theory of value, but now our explanation is based on the opportunity cost theory.

2.5C The Production Possibility Frontier under Constant Costs

Opportunity costs can be illustrated with the production possibility frontier, or transformation curve. The production possibility frontier is a curve that shows the *alternative* combinations

■ TABLE 2.4. Production Possibility Schedules for Wheat and Cloth in the United States and the United Kingdom

United States		United Kingdom	
Wheat	Cloth	Wheat	Cloth
180	0	60	0
150	20	50	20
120	40	40	40
90	60	30	60
60	80	20	80
30	100	10	100
0	120	0	120

of the two commodities that a nation can produce by fully utilizing all of its resources with the best technology available to it.

Table 2.4 gives the (hypothetical) production possibility schedules of wheat (in million bushels/year) and cloth (in million yards/year) for the United States and the United Kingdom. We see that the United States can produce 180W and 0C, 150W and 20C, or 120W and 40C, down to 0W and 120C. For each 30W that the United States gives up, just enough resources are released to produce an additional 20C. That is, 30W = 20C (in the sense that both require the same amount of resources). Thus, the opportunity cost of one unit of wheat in the United States is 1W = ⅔C (the same as in Table 2.2) and remains constant. On the other hand, the United Kingdom can produce 60W and 0C, 50W and 20C, or 40W and 40C, down to 0W and 120C. It can increase its output by 20C for each 10W it gives up. Thus, the opportunity cost of wheat in the United Kingdom is 1W = 2C and remains constant.

The United States and United Kingdom production possibility schedules given in Table 2.4 are graphed as production possibility frontiers in Figure 2.1. Each point on a frontier represents one combination of wheat and cloth that the nation can produce. For example, at point *A*, the United States produces 90W and 60C. At point *A*′, the United Kingdom produces 40W and 40C.

Points inside, or below, the production possibility frontier are also possible but are inefficient, in the sense that the nation has some idle resources and/or is not using the best technology available to it. On the other hand, points above the production frontier cannot be achieved with the resources and technology currently available to the nation.

The downward, or negative, slope of the production possibility frontiers in Figure 2.1 indicates that if the United States and the United Kingdom want to produce more wheat, they must give up some of their cloth production. The fact that the production possibility frontiers of both nations are straight lines reflects the fact that their opportunity costs are constant. That is, for each additional 1W to be produced, the United States must give up ⅔C and the United Kingdom must give up 2C, *no matter from which point on its production possibility frontier the nation starts*.

Constant opportunity costs arise when (1) resources or factors of production are either perfect substitutes for each other or used in fixed proportion in the production of both commodities and (2) all units of the same factor are homogeneous or of exactly the same quality. Then, as each nation transfers resources from the production of cloth to the production of wheat, it will not have to use resources that are less and less suited to wheat production, no matter how much wheat it is already producing. The same is true for the production of more cloth. Thus, we have constant costs in the sense that the same amount of one commodity must be given up to produce each additional unit of the second commodity.

Although opportunity costs are constant in each nation, they differ among nations, providing the basis for trade. Constant costs are not realistic, however. They are discussed only because they serve as a convenient introduction to the more realistic case of increasing costs, discussed in the next chapter.

2.5D Opportunity Costs and Relative Commodity Prices

We have seen that the opportunity cost of wheat is equal to the amount of cloth that the nation must give up to release just enough resources to produce one additional unit of wheat. This is given by the (absolute) slope of the production possibility frontier, or transformation curve, and is sometimes referred to as the *marginal rate of transformation*.

Figure 2.1 shows that the (absolute) slope of the U.S. transformation curve is $120/180 = 2/3$ = opportunity cost of wheat in the United States and remains constant. The slope of the U.K. transformation curve is $120/60 = 2$ = opportunity cost of wheat in the United Kingdom and remains constant. On the assumptions that prices equal costs of production and that the nation does produce both some wheat and some cloth, the opportunity cost of wheat is equal to the price of wheat relative to the price of cloth (P_W/P_C).

Thus, $P_W/P_C = 2/3$ in the United States, and inversely $P_C/P_W = 3/2 = 1.5$. In the United Kingdom, $P_W/P_C = 2$, and $P_C/P_W = 1/2$. The lower P_W/P_C in the United States ($2/3$ as opposed to 2) is a reflection of its comparative advantage in wheat. Similarly, the lower P_C/P_W in the United Kingdom ($1/2$ as opposed to $2/3$) reflects its comparative advantage in cloth. Note that under constant costs, P_W/P_C is determined exclusively by production, or supply, considerations in each nation. Demand considerations do not enter at all in the determination of relative commodity prices.

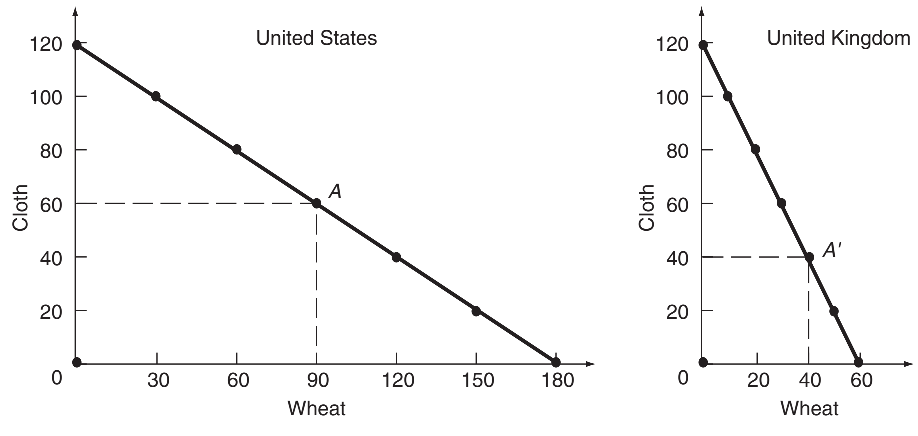

FIGURE 2.1. The Production Possibility Frontiers of the United States and the United Kingdom. The U.S. and U.K. production frontiers are obtained by plotting the values in Table 2.4. The frontiers are downward, or negatively sloped, indicating that as each nation produces more wheat, it must give up some cloth. Straight-line production possibility frontiers reflect constant opportunity costs.

To conclude, we can say that the difference in relative commodity prices between the two nations (given by the difference in the slope of their transformation curves) is a reflection of their comparative advantage and provides the basis for mutually beneficial trade.

2.6 The Basis for and the Gains from Trade under Constant Costs

In the absence of trade, a nation can only consume the commodities that it produces. As a result, the nation's production possibility frontier also represents its *consumption frontier*. Which combination of commodities the nation actually chooses to produce and consume depends on the people's tastes, or demand considerations.

2.6A Illustration of the Gains from Trade

In the absence of trade, the United States might choose to produce and consume combination *A* (90W and 60C) on its production possibility frontier (see Figure 2.2), and the United Kingdom might choose combination *A′* (40W and 40C).

With trade possible, the United States would specialize in the production of wheat (the commodity of its comparative advantage) and produce at point *B* (180W and 0C) on its production possibility frontier. Similarly, the United Kingdom would specialize in the production of cloth and produce at *B′* (0W and 120C). If the United States then exchanges 70W for 70C with the United Kingdom, it ends up consuming at point *E* (110W and 70C), and the United Kingdom ends up consuming at *E′* (70W and 50C). Thus, the United States gains 20W and 10C from trade (compare point *E* with point *A* in Figure 2.2), and the United Kingdom gains 30W and 10C (compare point *A′* with point *E′*).

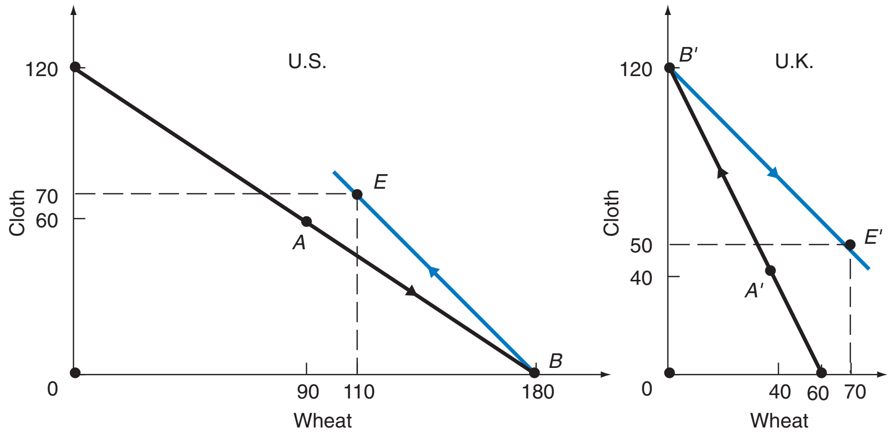

FIGURE 2.2. The Gains from Trade.
In the absence of trade, the United States produces and consumes at *A*, and the United Kingdom at *A′*. With trade, the United States specializes in the production of wheat and produces at *B*, while the United Kingdom specializes in the production of cloth and produces at *B′*. By exchanging 70W for 70C with the United Kingdom, the United States ends up consuming at *E* (and gains 20W and 10C), while the United Kingdom ends up consuming at *E′* (and gains 30W and 10C).

The increased consumption of both wheat and cloth in both nations was made possible by the increased output that resulted as each nation specialized in the production of the commodity of its comparative advantage. That is, in the absence of trade, the United States produced 90W and the United Kingdom 40W, for a total of 130W. With specialization in production and trade, 180W are produced (all in the United States). Similarly, in the absence of trade, the United States produced 60C and the United Kingdom 40C, for a total of 100C. With specialization in production and trade, 120C are produced (all in the United Kingdom).

It is this increase in output of 50W and 20C resulting from specialization in production that is shared by the United States and the United Kingdom and represents their gains from trade. Recall that in the absence of trade, the United States would not specialize in the production of wheat because it also wanted to consume some cloth. Similarly, the United Kingdom would not specialize in the production of cloth in the absence of trade because it also wanted to consume some wheat.

2.6B Relative Commodity Prices with Trade

We can gain a deeper understanding of our trade model by using the supply and demand curves for wheat and cloth shown in Figure 2.3. Figure 2.3 will also help us see how the equilibrium-relative commodity price with specialization in production and trade is determined.

In the left panel of Figure 2.3, $S_{W(US+UK)}$ is the combined supply curve of wheat of the United States and the United Kingdom if both countries used all of their resources to produce only wheat. Distance $0B = 180\text{W}$ represents the maximum quantity of wheat that the United States could produce with complete specialization in wheat production at the constant opportunity cost of $P_W/P_C = 2/3$ (just as in the left panel of Figure 2.2). Distance

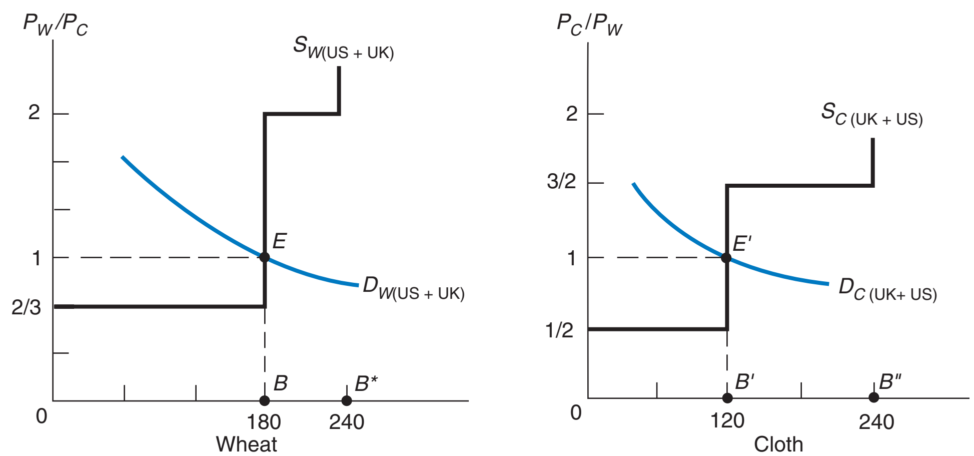

FIGURE 2.3. Equilibrium-Relative Commodity Prices with Demand and Supply.
In the left panel, $S_{W(US+UK)}$ is the combined U.S. and U.K. supply curve of wheat. It shows that the United States could produce a maximum of $180\text{W} = 0B$ at $P_W/P_C = 2/3$, while the United Kingdom could produce a maximum of $60\text{W} = BB^*$ at $P_W/P_C = 2$. $D_{W(US+UK)}$ is the combined demand curve for wheat of the United States and the United Kingdom with trade. $D_{W(US+UK)}$ intersects $S_{W(US+UK)}$ at point E, resulting in the equilibrium quantity of 180W (all of which is produced in the United States) and equilibrium price of $P_W/P_C = 1$ with trade. The right panel shows equilibrium for cloth at the intersection of $D_{C(UK+US)}$ with $S_{C(UK+US)}$ at point E' with 120C (all of which is produced in the United Kingdom) and $P_C/P_W = 1$.

$BB^* = 60W$ is the maximum quantity of wheat that the United Kingdom could produce at the constant opportunity cost of $P_W/P_C = 2$ (as in the right panel of Figure 2.2). Thus, 240W is the maximum combined total quantity of wheat that the United States and the United Kingdom could produce if both nations used all of their resources to produce wheat. As a result, the $S_{W(US+UK)}$ curve is vertical at 240W.

Suppose that, with trade, the combined demand curve for cloth of the United States and the United Kingdom is $D_{W(US+UK)}$, as shown in the left panel of Figure 2.3. $D_{W(US+UK)}$ intersects $S_{W(US+UK)}$ at point E, determining the equilibrium quantity of 180W and the equilibrium relative price of $P_W/P_C = 1$ with trade (the same as in the left panel of Figure 2.2). Note that, with trade, wheat is produced only in the United States, and the United States specializes completely in the production of wheat.

We can do the same for cloth. In the right panel of Figure 2.3, $S_{C(UK+US)}$ is the combined supply curve of cloth of the United Kingdom and the United States if both countries used all of their resources to produce only cloth. The United Kingdom can produce a maximum of $120C = 0B'$ at the constant $P_C/P_W = 1/2$ and the United States can produce a maximum of another $120C = B'B''$ at the constant $P_C/P_W = 3/2$ (as in Figure 2.2).

Suppose that, with trade, the combined demand for cloth of the United Kingdom and the United States is $D_{C(UK+US)}$, as shown in the right panel of Figure 2.3. $D_{C(UK+US)}$ intersects $S_{C(UK+US)}$ at point E', determining the equilibrium quantity of 120C and the equilibrium-relative price of $P_C/P_W = P_W/P_C = 1$ (the same as in the right panel of Figure 2.2). Note that, with trade, cloth is produced only in the United Kingdom, and the United Kingdom specializes completely in the production of cloth.

Finally, note that with complete specialization in production in both countries, the equilibrium-relative commodity price of each commodity is between the pretrade relative commodity price in each nation (see both panels of Figure 2.3). However, if in the left panel of Figure 2.3 $D_{W(US+UK)}$ were lower and intersected $S_{W(US+UK)}$ between points 0 and B on the horizontal portion of $S_{W(US+UK)}$ at $P_W/P_C = 2/3$, trade would take place at the pretrade relative commodity price of wheat of $P_W/P_C = 2/3$ in the United States and the United Kingdom would receive all the gains from trade. This would occur if the United Kingdom were a small country that specialized completely in the production of cloth and the United States were larger and did not specialize completely in the production of wheat (see Problem 10, with answer at www.wiley.com/college/salvatore). This is known as the small-country case and shows the "importance of being unimportant." This benefit, however, is not without cost since the small nation (here, the United Kingdom) faces the risk of a possible future reduction in demand for the only commodity it produces.

2.7 Empirical Tests of the Ricardian Model

We now examine the results of empirical tests of the Ricardian trade model. We will see that if we allow for different labor productivities in various industries in different nations, the Ricardian trade model does a reasonably good job at explaining the pattern of trade.

The first such empirical test of the Ricardian trade model was conducted by *MacDougall* in 1951 and 1952, using labor productivity and export data for 25 industries in the United States and the United Kingdom for the year 1937.

Since wages were twice as high in the United States as in the United Kingdom, MacDougall argued that costs of production would be lower in the United States in those industries where American labor was more than twice as productive as British labor. These

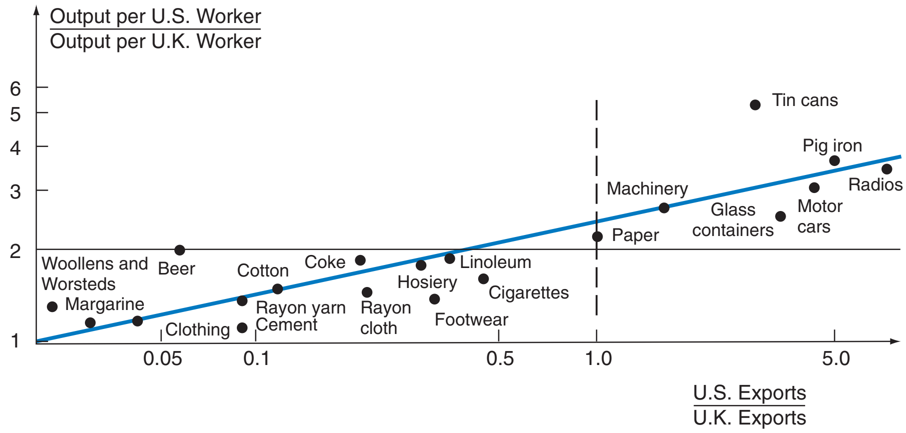

FIGURE 2.4. Relative Labor Productivities and Comparative Advantage—United States and United Kingdom.
The figure shows a positive relationship between labor productivity and export shares for 20 industries in the United States and the United Kingdom, thus confirming the Ricardian trade model.
Source: Adapted from G. D. A. MacDougall, ''British and American Exports: A Study Suggested by the Theory of Comparative Costs,'' *Economic Journal*, December 1951, p. 703.

would be the industries in which the United States had a comparative advantage with respect to the United Kingdom and in which it would undersell the United Kingdom in third markets (i.e., in the rest of the world). On the other hand, the United Kingdom would have a comparative advantage and undersell the United States in those industries where the productivity of British labor was more than one-half the productivity of American labor.

In his test MacDougall excluded trade between the United States and the United Kingdom because tariffs varied widely from industry to industry, tending to offset the differences in labor productivity between the two nations. At the same time, both nations faced generally equal tariffs in third markets. The exclusion of trade between the United States and the United Kingdom did not bias the test because their exports to each other constituted less than 5 percent of their total exports.

Figure 2.4 summarizes MacDougall's results. The vertical axis measures the ratio of output per U.S. worker to output per U.K. worker. The higher this ratio, the greater the relative productivity of U.S. labor. The horizontal axis measures the ratio of U.S. to U.K. exports to third markets. The higher this ratio, the larger are U.S. exports in relation to U.K. exports to the rest of the world. Note that the scales are logarithmic (so that equal distances refer to equal *percentage* changes) rather than arithmetic (where equal distances would measure equal *absolute* changes).

The points in the figure exhibit a clear *positive* relationship (shown by the colored line) between labor productivity and exports. That is, those industries where the productivity of labor is relatively higher in the United States than in the United Kingdom are the industries with the higher ratios of U.S. to U.K. exports. This was true for the 20 industries shown in the figure (out of the total of 25 industries studied by MacDougall). The positive relationship between labor productivity and exports for the United States and the United Kingdom was confirmed by subsequent studies by *Balassa* using 1950 data and *Stern* using 1950 and 1959 data. Additional and more recent confirmation of the Ricardian trade model is provided by *Golub* (see Case Study 2-4).

CASE STUDY 2-4 Relative Unit Labor Costs and Relative Exports—United States and Japan

In a 1995 study of the Ricardian trade model, Golub examined relative unit labor costs (the ratio of wages to unit labor productivity) and the exports of the United States relative to those of the United Kingdom, Japan, Germany, Canada, and Australia and found that, in general, relative unit labor costs and exports were inversely related. That is, the higher the relative unit labor costs in the nation, the lower the relative exports of the nation, and vice versa. This relationship is particularly strong for U.S.-Japanese trade.

The colored line in Figure 2.5 shows a clear negative correlation between relative unit labor costs and relative exports for the 33 industries that Golub studied for trade between the United States and Japan for 1990, thus lending additional support to the Ricardian trade model. Note that the relationship between relative unit labor *costs* and relative exports is negative in Figure 2.5, whereas the relationship between relative unit labor *productivities* and exports shares is positive in Figure 2.4 because relative unit labor costs are the inverse of relative unit labor productivities. The above results were confirmed in a 2000 study by Golub and Hsieh for trade in the products of 39 sectors between the United States and nine other countries (Japan, Germany, the United Kingdom, France, Italy, Canada, Australia, Mexico, and Korea) from 1972 to 1991.

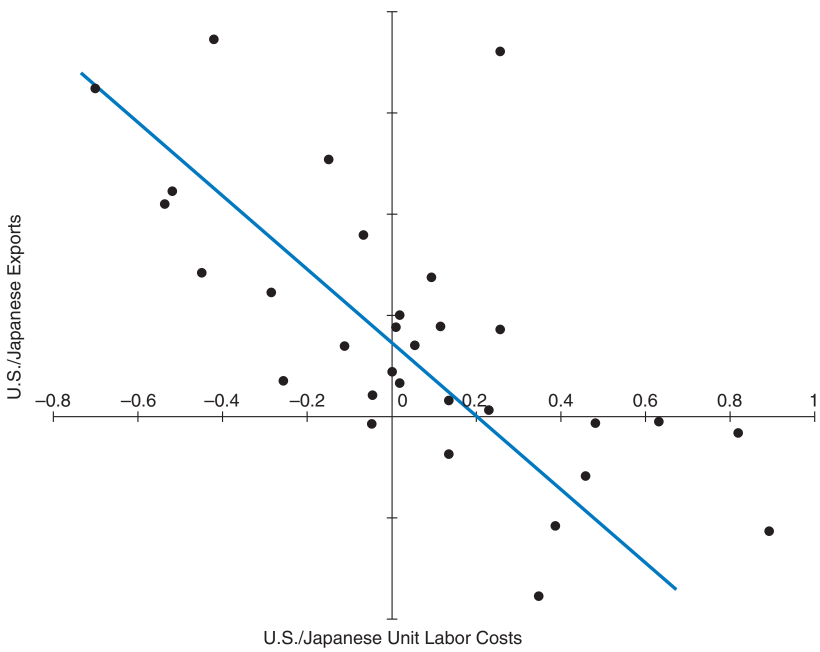

FIGURE 2.5. Relative Exports and Relative Unit Costs—United States and Japan.
The figure shows a clear negative correlation between relative exports and relative unit labor costs for 33 industries between the United States and Japan. It shows that the higher are U.S. relative labor costs, the lower are its exports in relation to Japan, thus supporting the Ricardian trade model.
Source: Adapted from S. S. Golub. *Comparative and Absolute Advantage in the Asia-Pacific Region* (San Francisco: Federal Reserve Bank of San Francisco, Center for Pacific Basin Monetary and Economic Studies, 1995). p. 46; and S. S. Golub and C. T. Hsieh, ''The Classical Ricardian Theory of Comparative Advantage Revisited,'' *Review of International Economics*, May 2000, pp. 221–234.

These empirical studies all seem to support the Ricardian theory of comparative advantage. That is, the actual pattern of trade seems to be based on the different labor productivities in different industries in the two nations. Production costs other than labor costs, demand considerations, political ties, and various obstructions to the flow of international trade did not break the link between relative labor productivity and export shares.

One possible question remained. Why did the United States not capture the entire export market from the United Kingdom (rather than only a rising share of exports) in those industries where it enjoyed a cost advantage (i.e., where the ratio of the productivity of U.S. labor to U.K. labor was greater than 2)? MacDougall answered that this was due mainly to product differentiation. That is, the output of the same industry in the United States and the United Kingdom is not homogeneous. An American car is not identical to a British car. Even if the American car is cheaper, some consumers in the rest of the world may still prefer the British car. Thus, the United Kingdom continues to export some cars even at a higher price. However, as the price difference grows, the United Kingdom's share of car exports can be expected to decline. The same is true for most other products. Similarly, the United States continues to export to third markets some commodities in which it has a cost disadvantage with respect to the United Kingdom. We return to this important point in Section 6.4A.

Even though the simple Ricardian trade model has been empirically verified to a large extent, it has a serious shortcoming in that it assumes rather than explains comparative advantage. That is, Ricardo and classical economists in general provided no explanation for the difference in labor productivity and comparative advantage between nations, and they could not say much about the effect of international trade on the earnings of factors of production. By providing answers to both of these important questions, the Heckscher-Ohlin model (discussed in Chapter 5) theoretically improves on and extends the Ricardian model.

SUMMARY

1. This chapter examined the development of trade theory from the mercantilists to Smith, Ricardo, and Haberler and sought to answer two basic questions: (a) What is the basis for and what are the gains from trade? and (b) What is the pattern of trade?

2. The mercantilists believed that a nation could gain in international trade only at the expense of other nations. As a result, they advocated restrictions on imports, incentives for exports, and strict government regulation of all economic activities.

3. According to Adam Smith, trade is based on absolute advantage and benefits both nations. (The discussion assumes a two-nation, two-commodity world.) That is, when each nation specializes in the production of the commodity of its absolute advantage and exchanges part of its output for the commodity of its absolute disadvantage, both nations end up consuming more of both commodities. Absolute advantage, however, explains only a small portion of international trade today.

4. David Ricardo introduced the law of comparative advantage. This postulates that even if one nation is less efficient than the other nation in the production of both commodities, there is still a basis for mutually beneficial trade (as long as the absolute disadvantage that the first nation has with respect to the second is not in the same proportion in both commodities). The less efficient nation should specialize in the production and export of the commodity in which its absolute disadvantage is smaller. (This is the commodity of its comparative advantage.) Ricardo, however, explained the law of comparative advantage in terms of the labor theory of value, which is unacceptable.

5. Gottfried Haberler came to the "rescue" by explaining the law of comparative advantage in terms of the

opportunity cost theory. This states that the cost of a commodity is the amount of a second commodity that must be given up to release just enough resources to produce one additional unit of the first commodity. The opportunity cost of a commodity is equal to the relative price of that commodity and is given by the (absolute) slope of the production possibility frontier. A straight-line production possibility frontier reflects constant opportunity costs.

6. In the absence of trade, a nation's production possibility frontier is also its consumption frontier. With trade, each nation can specialize in producing the commodity of its comparative advantage and exchange part of its output with the other nation for the commodity of its comparative disadvantage. By so doing, both nations end up consuming more of both commodities than without trade. With complete specialization, the equilibrium-relative commodity prices will be between the pretrade-relative commodity prices prevailing in each nation.

7. The first empirical test of the Ricardian trade model was conducted by MacDougall in 1951 and 1952 using 1937 data. The results indicated that those industries where labor productivity was relatively higher in the United States than in the United Kingdom were the industries with the higher ratios of U.S. to U.K. exports to third markets. These results were confirmed by Balassa using 1950 data, Stern using 1950 and 1959 data, Golub using 1990 data, and Golub and Hsieh using 1972–1991 data. Thus, it can be seen that comparative advantage seems to be based on a difference in labor productivity or costs, as postulated by Ricardo. However, the Ricardian model explains neither the reason for the difference in labor productivity or costs across nations nor the effect of international trade on the earnings of factors.

A LOOK AHEAD

In Chapter 3, we examine the basis for and the gains from trade, as well as the pattern of trade in the more realistic case of increasing costs. Our model will then be completed in Chapter 4, where we see formally how the rate at which commodities are exchanged in international trade is actually determined. This will also determine how the gains from trade are in fact divided between the two trading nations.

KEY TERMS

Absolute advantage, p. 34
Basis for trade, p. 31
Complete specialization, p. 47
Constant opportunity costs, p. 43
Gains from trade, p. 31
Labor theory of value, p. 41
Laissez-faire, p. 35
Law of comparative advantage, p. 36
Mercantilism, p. 32
Opportunity cost theory, p. 42
Pattern of trade, p. 31
Production possibility frontier, p. 42
Relative commodity prices, p. 44
Small-country case, p. 47

QUESTIONS FOR REVIEW

1. What are the basic questions that we seek to answer in this chapter? In what way is the model presented in this chapter an abstraction or a simplification of the real world? Can the model be generalized?

2. What were the mercantilists' views on trade? How does their concept of national wealth differ from today's view?

3. Why is it important to study the mercantilists' views on trade? How were their views different from those of Adam Smith? What is the relevance of all this today?

4. What was the basis for and the pattern of trade according to Adam Smith? How were gains from trade generated? What policies did Smith advocate

in international trade? What did he think was the proper function of government in the economic life of the nation?

5. In what way was Ricardo's law of comparative advantage superior to Smith's theory of absolute advantage? How do gains from trade arise with comparative advantage? How can a nation that is less efficient than another nation in the production of all commodities export anything to the second nation?

6. What is the exception to the law of comparative advantage? How prevalent is it?

7. Why is Ricardo's explanation of the law of comparative advantage unacceptable? What acceptable theory can be used to explain the law?

8. What is the relationship between opportunity costs and the production possibility frontier of a nation? How does the production possibility frontier look under constant opportunity costs? What is the relationship between the opportunity cost of a commodity and the relative price of that commodity? How can they be visualized graphically?

9. Why is a nation's production possibility frontier the same as its consumption frontier in the absence of trade? How does the nation decide how much of each commodity to consume in the absence of trade?

10. What is meant by complete specialization? by incomplete specialization? Why do both nations gain from trade in the first instance but only the small nation in the second?

11. How is the combined supply curve of both nations for each of the traded commodities determined? How is the equilibrium-relative commodity price determined with trade?

12. What are the results of empirical testing of the Ricardian model?

PROBLEMS

1. Table 2.5 shows bushels of wheat and yards of cloth that the United States and the United Kingdom can produce with one hour of labor time under four different hypothetical situations. In each case, identify the commodity in which the United States and the United Kingdom have an absolute advantage or disadvantage.

*2. With respect to Table 2.5, indicate in each case the commodity in which each nation has a comparative advantage or disadvantage.

3. With respect to Table 2.5, indicate in each case whether or not trade is possible and the basis for trade.

*4. Suppose that in Case B in Table 2.5 the United States exchanges 4W for 4C with the United Kingdom.

(a) How much does the United States gain in terms of cloth?

(b) How much does the United Kingdom gain in terms of cloth?

(c) What is the range for mutually beneficial trade?

(d) How much would each nation gain if they exchanged 4W for 6C instead?

5. Use the information for Case B in Table 2.5 and assume that labor is the only factor of production and is homogeneous (i.e., all of one type).

(a) What is the cost *in terms of labor content* of producing wheat and cloth in the United States and the United Kingdom?

TABLE 2.5. Production Possibilities in the United States and the United Kingdom

	Case A		Case B		Case C		Case D	
	U.S.	U.K.	U.S.	U.K.	U.S.	U.K.	U.S.	U.K.
Wheat (bushels/hour)	4	1	4	1	4	1	4	2
Cloth (yards/hour)	1	2	3	2	2	2	2	1

(b) What is the dollar price of wheat and cloth in the United States if the wage rate is $6?

(c) What is the pound price of wheat and cloth in the United Kingdom if the wage rate is £1?

6. Answer the following questions with reference to Problem 5.

(a) What is the dollar price of wheat and cloth in the United Kingdom if the exchange rate between the pound and the dollar is £1 = $2? Would the United States be able to export wheat to the United Kingdom at this exchange rate? Would the United Kingdom be able to export cloth to the United States at this exchange rate?

(b) What if the exchange rate between the dollar and the pound were £1 = $4?

(c) What if the exchange rate were £1 = $1?

(d) What is the *range* of exchange rates that will allow the United States to export wheat to the United Kingdom and the United Kingdom to export cloth to the United States?

7. Assume that the data in Case B in Table 2.5 refer to millions of bushels of wheat and millions of yards of cloth.

(a) Plot on graph paper the production frontiers of the United States and the United Kingdom.

(b) What is the relative price of wheat (i.e., P_W/P_C) in the United States and in the United Kingdom in autarky (no trade)?

(c) What is the relative price of cloth (i.e., P_C/P_W) in the United States and in the United Kingdom in autarky?

8. Using the United States and United Kingdom production frontiers from Problem 7, assume that the no-trade or autarky point is 3W and ¾C (in million units) in the United States and ½W and 1C in the United Kingdom. Also assume that with the opening of trade the United States exchanges 1W for 1C with the United Kingdom. Show graphically for the United States and the United Kingdom the autarky (or no-trade) point of production and consumption, the point of production and consumption with trade, and the gains from trade.

9. **(a)** What would be the equilibrium-relative commodity price of wheat if $D_{W(US+UK)}$ shifted up by one-third in the left panel of Figure 2.3? How much wheat and cloth would the United States and the United Kingdom then produce?

(b) What does the answer to part (a) imply for $D_{C(UK+US)}$ in the right panel of Figure 2.3?

***10.** What would happen if $D_{W(US+UK)}$ intersected the horizontal portion of $S_{W(US+UK)}$ at $P_W/P_C = 2/3$ and 120W in the left panel of Figure 2.3? What would this imply for specialization in production and the distribution in the gains from trade between the two nations?

11. Draw a figure similar to Figure 2.2 showing that the United Kingdom is now a small country, half the size shown in the right panel of Figure 2.2, and trades 20C for 30W with the United States at $P_W/P_C = 2/3$.

12. **(a)** How was the Ricardian trade model tested empirically?

(b) In what way can the results be said to confirm the Ricardian model?

(c) Why do we then need other trade models?

13. How would you counter the argument that the United States needs to restrict textile imports in order to save American jobs?

*= Answer provided at www.wiley.com/college/salvatore.

APPENDIX

We now extend the theory of comparative advantage first to the case of more than two commodities and then to the case of more than two nations. In each case, we will see that the theory of comparative advantage is easily generalized.

A2.1 Comparative Advantage with More Than Two Commodities

Table 2.6 shows the dollar and the pound cost, or price, of five commodities in the United States and the United Kingdom. (In economics, "cost" includes the return to all factors, including "normal profits"; thus, "cost" and "price" are used interchangeably here.)

TABLE 2.6. Commodity Prices in the United States and United Kingdom

Commodity	Price in the U.S.	Price in the U.K.
A	\$2	£6
B	4	4
C	6	3
D	8	2
E	10	1

To determine which commodities will be exported and imported by the United States and the United Kingdom, we must first express all commodity prices in terms of the same currency and then compare prices in the two nations. For example, if the exchange rate between the dollar and the pound is £1 = \$2, the *dollar* prices of the commodities in the United Kingdom would be

Commodity	A	B	C	D	E
Dollar price in the U.K.	12	8	6	4	2

At this exchange rate, the dollar prices of commodities A and B are lower in the United States than in the United Kingdom; commodity C is equally priced in the two nations; and the dollar prices of commodities D and E are lower in the United Kingdom. As a result, the United States will export commodities A and B to the United Kingdom and import commodities D and E from the United Kingdom. Commodity C will not be traded.

Now assume that the exchange rate between the dollar and the pound is £1 = \$3. The dollar prices of the commodities in the United Kingdom would be:

Commodity	A	B	C	D	E
Dollar price in the U.K.	18	12	9	6	3

At this higher exchange rate, the dollar prices of commodities A, B, and C are lower in the United States, while the dollar prices of commodities D and E are lower in the United Kingdom. Thus, the United States would export commodities A, B, and C to the United Kingdom and import commodities D and E from the United Kingdom. Note that commodity C, which was not traded at the exchange rate of £1 = \$2, is now exported by the United States at the exchange rate of £1 = \$3.

Finally, if the exchange rate were £1 = \$1, the dollar prices of the commodities in the United Kingdom would be:

Commodity	A	B	C	D	E
Dollar price in the U.K.	6	4	3	2	1

In this case, the United States would export only commodity A to the United Kingdom and import all other commodities, with the exception of commodity B (which would not be traded because it is now equally priced in the two nations).

The actual exchange rate between the dollar and the pound will settle at the level at which *the value of U.S. exports to the United Kingdom exactly equals the value of the U.S. imports from the United Kingdom* (in the absence of other international transactions). Once this equilibrium exchange rate is established, we will be able to determine exactly which commodities are exported by the United States and which are exported by the United Kingdom. Each nation will then have a comparative advantage in the commodities that it exports at the particular equilibrium exchange rate established. (We abstract here from the situation where the exchange rate remains out of equilibrium for long periods of time.)

What we can say on the basis of Table 2.6 is that the U.S. comparative advantage is greatest in commodity A, and the United States must export at least this commodity. For this to be possible, the exchange rate between the dollar and the pound must be £1 > \$0.33. The United Kingdom's comparative advantage is highest in commodity E, so that the United Kingdom must export at least commodity E. For this to be possible, the exchange rate between the dollar and the pound must be £1 < \$10. This discussion can be generalized to cover any number of commodities.

A2.2 Comparative Advantage with More Than Two Nations

Suppose that, instead of two nations and five commodities, we have two commodities (wheat and cloth) and five nations (A, B, C, D, and E). Table 2.7 ranks these nations from lowest to highest in terms of their internal P_W/P_C values. With trade, the equilibrium P_W/P_C will settle somewhere between 1 and 5. That is, $1 < P_W/P_C < 5$.

If the equilibrium $P_W/P_C = 3$ with trade, Nations A and B will export wheat to Nations D and E in exchange for cloth. Nation C will not engage in international trade in this case because its pretrade P_W/P_C equals the equilibrium P_W/P_C with trade. Given a trade equilibrium $P_W/P_C = 4$, Nations A, B, and C will export wheat to Nation E in exchange for cloth, and Nation D will not engage in international trade. If the equilibrium $P_W/P_C = 2$ with trade, Nation A will export wheat to all the other nations, with the exception of Nation B, in exchange for cloth.

This discussion can easily be extended to any number of countries. However, generalizing our analysis to many commodities *and* many nations at the same time becomes cumbersome and is unnecessary. What is important at this point is that the conclusions reached on the basis of our simple model with only two nations and two commodities *can* be generalized and are indeed applicable to the case of many nations and many commodities.

Problem Set up an example of trade with three commodities and three nations in such a way that each of the three nations exports one of the commodities to, and imports one of the commodities from, each of the other two nations.

TABLE 2.7. Ranking of Nations in Terms of Internal P_W/P_C

Nation	A	B	C	D	E
P_W/P_C	1	2	3	4	5

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For trade policies of all the member countries of the World Trade Organization, see:

http://www.wto.org

For information and description of new reports and analyses on international trade theory and policies, generally supporting a liberal trading system, published by the Institute for International Economics, see:

http://www.iie.com

The case against free trade is made by the Public Citizen Global Trade Watch, an organization created by Ralph Nader (the consumer advocate), which is found at:

http://www.citizen.org/trade

The Standard Theory of International Trade

chapter 3

LEARNING GOALS:

After reading this chapter, you should be able to:

- Understand how relative commodity prices and the comparative advantage of nations are determined under increasing costs
- Show the basis and the gains from trade with increasing costs
- Explain the relationship between international trade and deindustrialization in the United States and other advanced nations

3.1 Introduction

This chapter extends our simple trade model to the more realistic case of increasing opportunity costs. Tastes or demand preferences are introduced with community indifference curves. We then see how these forces of supply and demand determine the equilibrium-relative commodity price in each nation in the absence of trade under increasing costs. This will also indicate the commodity of comparative advantage for each nation.

Subsequently, we examine how, with trade, each nation gains by specializing in the production of the commodity of its comparative advantage and exporting some of its output in exchange for the commodity of its comparative disadvantage. The last section of the chapter shows how mutually beneficial trade is possible even when two nations are exactly alike except for tastes under increasing cost conditions.

In this and in the following chapters, it will be convenient to generalize the presentation and deal with Nation 1 and Nation 2 (instead of the United States and United Kingdom) and commodity X and commodity Y (instead of wheat and cloth).

The appendix to this chapter is a review of those aspects of production theory that are essential for understanding the material presented in the appendices of the chapters that follow. This and the subsequent appendices can be omitted without loss of continuity in the text.

3.2 The Production Frontier with Increasing Costs

It is more realistic for a nation to face increasing rather than constant opportunity costs. Increasing opportunity costs mean that the nation must give up more and more of one commodity to release just enough resources to produce each additional unit of another commodity. Increasing opportunity costs result in a production frontier that is concave from the origin (rather than a straight line).

3.2A Illustration of Increasing Costs

Figure 3.1 shows the hypothetical production frontier of commodities X and Y for Nation 1 and Nation 2. Both production frontiers are concave from the origin, reflecting the fact that each nation incurs increasing opportunity costs in the production of *both* commodities.

Suppose that Nation 1 wants to produce more of commodity X, starting from point *A* on its production frontier. Since at point *A* the nation is already utilizing all of its resources with the best technology available, the nation can only produce more of X by reducing the output of commodity Y. (In Chapter 2, we saw that this is the reason production frontiers are negatively sloped.)

Figure 3.1 shows that for each additional batch of 20X that Nation 1 produces, it must give up more and more Y. The increasing opportunity costs in terms of Y that Nation 1 faces are reflected in the longer and longer downward arrows in the figure, and result in a production frontier that is concave from the origin.

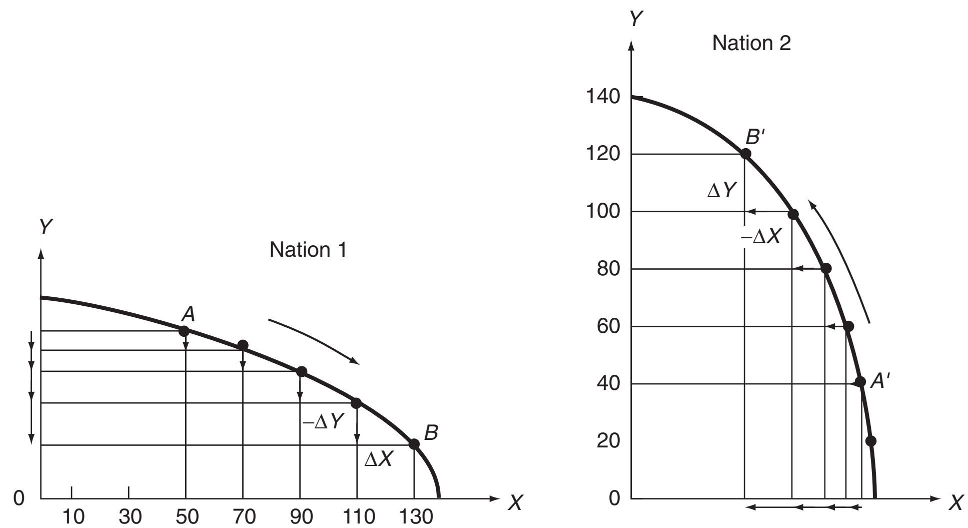

FIGURE 3.1. Production Frontiers of Nation 1 and Nation 2 with Increasing Costs. Concave production frontiers reflect increasing opportunity costs in each nation in the production of *both* commodities. Thus, Nation 1 must give up more and more of Y for each additional batch of 20X that it produces. This is illustrated by downward arrows of increasing length. Similarly, Nation 2 incurs increasing opportunity costs in terms of forgone X (illustrated by the increasing length of the leftward arrows) for each additional batch of 20Y it produces.

Nation 1 also faces increasing opportunity costs in the production of Y. This could be demonstrated graphically by showing that Nation 1 has to give up increasing amounts of X for each additional batch of 20Y that it produces. However, instead of showing this for Nation 1, we demonstrate increasing opportunity costs in the production of Y with the production frontier of Nation 2 in Figure 3.1.

Moving upward from point A' along the production frontier of Nation 2, we observe leftward arrows of increasing length, reflecting the increasing amounts of X that Nation 2 must give up to produce each additional batch of 20Y. Thus, concave production frontiers for Nation 1 and Nation 2 reflect increasing opportunity costs in each nation in the production of *both* commodities.

3.2B The Marginal Rate of Transformation

The marginal rate of transformation (MRT) of X for Y refers to the amount of Y that a nation must give up to produce each additional unit of X. Thus, MRT is another name for the opportunity cost of X (the commodity measured along the horizontal axis) and is given by the (absolute) *slope* of the production frontier at the point of production.

If in Figure 3.1 the slope of the production frontier (MRT) of Nation 1 at point A is ¼, this means that Nation 1 must give up ¼ of a unit of Y to release just enough resources to produce one additional unit of X at this point. Similarly, if the slope, or MRT, equals 1 at point B, this means that Nation 1 must give up one unit of Y to produce one additional unit of X at this point.

Thus, a movement from point A down to point B along the production frontier of Nation 1 involves an increase in the slope (MRT) from ¼ (at point A) to 1 (at point B) and reflects the increasing opportunity costs in producing more X. This is in contrast to the case of a straight-line production frontier (as in Chapter 2), where the opportunity cost of X is constant regardless of the level of output and is given by the constant value of the slope (MRT) of the production frontier.

3.2C Reasons for Increasing Opportunity Costs and Different Production Frontiers

We have examined the meaning of increasing opportunity costs as reflected in concave production frontiers. But how do increasing opportunity costs arise? And why are they more realistic than constant opportunity costs?

Increasing opportunity costs arise because resources or factors of production (1) are not homogeneous (i.e., all units of the same factor are not identical or of the same quality) and (2) are not used in the *same* fixed proportion or intensity in the production of all commodities. This means that as the nation produces more of a commodity, it must utilize resources that become progressively less efficient or less suited for the production of that commodity. As a result, the nation must give up more and more of the second commodity to release just enough resources to produce each additional unit of the first commodity.

For example, suppose some of a nation's land is flat and suited for growing wheat, and some is hilly and better suited for grazing and milk production. The nation originally specialized in wheat but now wants to concentrate on producing milk. By transferring its hilly areas from wheat growing to grazing, the nation gives up very little wheat and obtains a great deal of milk. Thus, the opportunity cost of milk in terms of the amount of wheat given up is initially small. But if this transfer process continues, eventually flat land, which is better suited for wheat growing, will have to be used for grazing. As a result, the opportunity cost of milk will rise, and the production frontier will be concave from the origin.

The difference in the production frontiers of Nation 1 and Nation 2 in Figure 3.1 is due to the fact that the two nations have different factor endowments or resources at their disposal and/or use different technologies in production. In the real world, the production frontiers of different nations will usually differ, since practically no two nations have identical factor endowments (even if they could have access to the same technology).

As the supply or availability of factors and/or technology changes over time, a nation's production frontier shifts. The type and extent of these shifts depend on the type and extent of the changes that take place. These changes are examined in detail in Chapter 7, which deals with economic growth and its effect on international trade.

3.3 Community Indifference Curves

So far, we have discussed production, or supply, considerations in a nation, as reflected in its production frontier. We now introduce the tastes, or demand preferences, in a nation. These are given by community (or social) indifference curves.

A community indifference curve shows the various combinations of two commodities that yield equal satisfaction to the community or nation. Higher curves refer to greater satisfaction, lower curves to less satisfaction. Community indifference curves are negatively sloped and convex from the origin. To be useful, they must not cross. (Readers familiar with an individual's indifference curves will note that community indifference curves are almost completely analogous.)

3.3A Illustration of Community Indifference Curves

Figure 3.2 shows three hypothetical indifference curves for Nation 1 and Nation 2. They differ on the assumption that tastes, or demand preferences, are different in the two nations.

Points N and A give equal satisfaction to Nation 1, since they are both on indifference curve I. Points T and H refer to a higher level of satisfaction, since they are on a higher indifference curve (II). Even though T involves more of Y but less of X than A, satisfaction is greater at T because it is on indifference curve II. Point E refers to still greater satisfaction, since it is on indifference curve III. For Nation 2, $A' = R' < H' < E'$.

Note that the community indifference curves in Figure 3.2 are negatively sloped. This is always the case because as a nation consumes more of X, it must consume less of Y if the nation is to have the same level of satisfaction (i.e., remain on the same level of satisfaction). Thus, as Nation 1 moves from N to A on indifference curve I, it consumes more of X but less of Y. Similarly, as Nation 2 moves from A' to R' on indifference curve I′, it consumes more of X but less of Y. If a nation continued to consume the same amount of Y as it increased its consumption of X, the nation would necessarily move to a higher indifference curve.

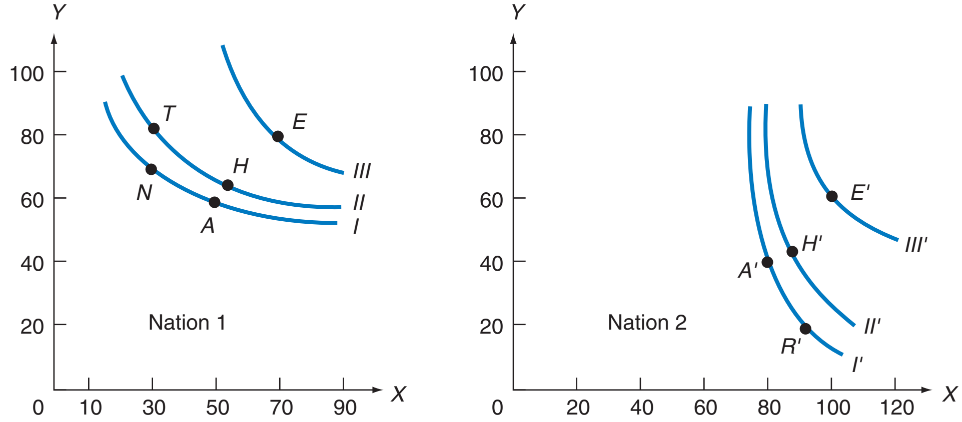

FIGURE 3.2. Community Indifference Curves for Nation 1 and Nation 2.
A community indifference curve shows the various combinations of X and Y that yield equal satisfaction to the community or nation. A higher curve refers to a higher level of satisfaction. Community indifference curves are downward, or negatively, sloped and convex from the origin; to be useful, they must not cross. The declining slope of the curve reflects the diminishing marginal rate of substitution (MRS) of X for Y in consumption.

3.3B The Marginal Rate of Substitution

The marginal rate of substitution (MRS) of X for Y in consumption refers to the amount of Y that a nation could give up for one extra unit of X and *still remain on the same indifference curve*. This is given by the (absolute) slope of the community indifference curve at the point of consumption and declines as the nation moves down the curve. For example, the slope, or MRS, of indifference curve I is greater at point N than at point A (see Figure 3.2). Similarly, the slope, or MRS, of indifference curve I′ is greater at point A' than at R'.

The decline in MRS or absolute slope of an indifference curve is a reflection of the fact that the more of X and the less of Y a nation consumes, the more valuable to the nation is a unit of Y at the margin compared with a unit of X. Therefore, the nation can give up less and less of Y for each additional unit of X it wants.

Declining MRS means that community indifference curves are convex from the origin. Thus, while *increasing* opportunity cost in production is reflected in *concave* production frontiers, a *declining* marginal rate of substitution in consumption is reflected in *convex* community indifference curves. In Section 3.4, we will see that this convexity property of indifference curves is necessary to reach a unique (i.e., a single), well-behaved equilibrium consumption point for the nation.

3.3C Some Difficulties with Community Indifference Curves

As we said earlier, to be useful, community indifference curves must not intersect (cross). A point of intersection would refer to equal satisfaction on two different community indifference curves, which is inconsistent with their definition. Thus, the indifference curves of Nation 1 and Nation 2 in Figure 3.2 are drawn as nonintersecting.

However, a particular set, or map, of community indifference curves refers to a particular *income distribution* within the nation. A different income distribution would result in a completely new set of indifference curves, which might intersect previous indifference curves.

This is precisely what may happen as a nation opens trade or expands its level of trade. Exporters will benefit, while domestic producers competing with imports will suffer. There is also a differential impact on consumers, depending on whether an individual's consumption pattern is oriented more toward the X or the Y good. Thus, trade will change the distribution of real income in the nation and *may* cause indifference curves to intersect. In that case, we could not use community indifference curves to determine whether the opening or the expansion of trade increased the nation's welfare.

One way out of this impasse is through the so-called *compensation principle*. According to this principle, the nation benefits from trade if the gainers would be better off (i.e., retain some of their gain) even after fully compensating the losers for their losses. This is true whether or not compensation actually occurs. (One way that compensation would occur is for the government to tax enough of the gain to fully compensate the losers with subsidies or tax relief.) Alternatively, we could make a number of restrictive assumptions about tastes, incomes, and patterns of consumption that would preclude intersecting community indifference curves.

Although the compensation principle or restrictive assumptions do not completely eliminate all the conceptual difficulties inherent in using community indifference curves, they do allow us to draw them as nonintersecting (so that we can continue to make use of them, even if a bit cautiously).

3.4 Equilibrium in Isolation

In Section 3.2, we discussed production frontiers, which illustrate the production, or supply, conditions in a nation. In Section 3.3, we examined community indifference curves, which reflect the tastes, or demand preferences, in a nation. We will now see how the interaction of these forces of demand and supply determines the equilibrium point, or point of maximum social welfare, in a nation in isolation (i.e., in the absence of trade).

In the absence of trade, a nation is in equilibrium when it reaches the highest indifference curve possible given its production frontier. This occurs at the point where a community indifference curve is tangent to the nation's production frontier. The common slope of the two curves at the tangency point gives the internal equilibrium-relative commodity price in the nation and reflects the nation's comparative advantage. Let us see what all this means.

3.4A Illustration of Equilibrium in Isolation

Figure 3.3 brings together the production frontiers of Figure 3.1 and the community indifference curves of Figure 3.2. We see in Figure 3.3 that indifference curve I is the highest indifference curve that Nation 1 can reach with its production frontier. Thus, Nation 1 is in equilibrium, or maximizes its welfare, when it produces and consumes at point A in the absence of trade, or autarky. Similarly, Nation 2 is in equilibrium at point A', where its production frontier is tangent to indifference curve I$'$.

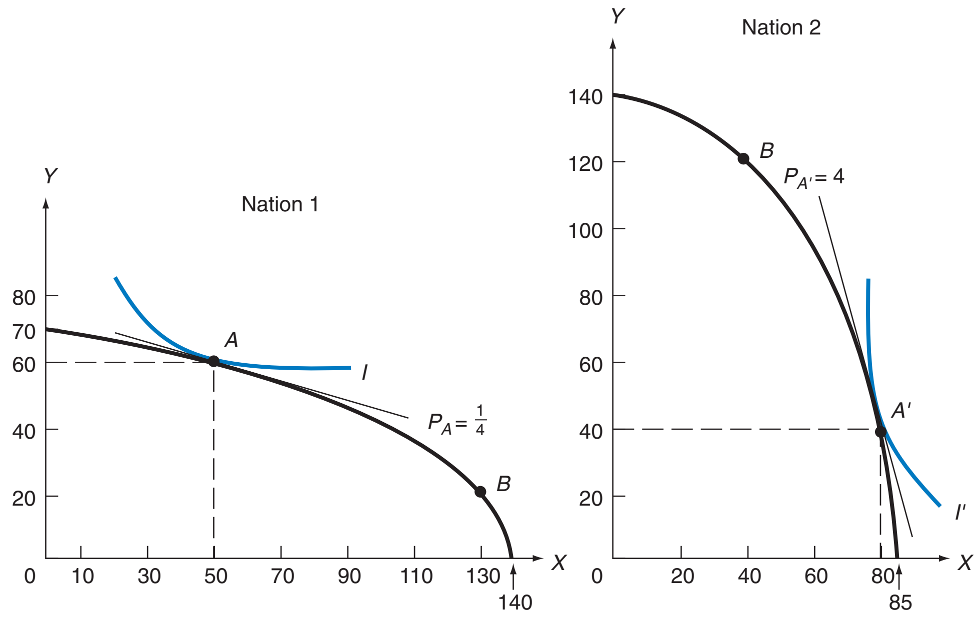

FIGURE 3.3. Equilibrium in Isolation.
Nation 1 is in equilibrium, or maximizes its welfare, in isolation by producing and consuming at point *A*, where its production frontier reaches (is tangent to) indifference curve I (the highest possible). Similarly, Nation 2 is in equilibrium at point *A*′, where its production frontier is tangent to indifference curve I′. The equilibrium-relative price of X in Nation 1 is given by the slope of the tangent common to its production frontier and indifference curve I at point *A*. This is $P_A = 1/4$. For Nation 2, $P_{A'} = 4$. Since the relative price of X is lower in Nation 1 than in Nation 2, Nation 1 has a comparative advantage in commodity X and Nation 2 in commodity Y.

Note that since community indifference curves are convex from the origin and drawn as nonintersecting, there is only one such point of tangency, or equilibrium. Furthermore, we can be certain that one such equilibrium point exists because there are an infinite number of indifference curves (i.e., the indifference map is dense). Points on lower indifference curves are possible but would not maximize the nation's welfare. On the other hand, the nation cannot reach higher indifference curves with the resources and technology presently available.

3.4B Equilibrium-Relative Commodity Prices and Comparative Advantage

The equilibrium-relative commodity price in isolation is given by the slope of the tangent common to the nation's production frontier and indifference curve at the autarky point of production and consumption. Thus, the equilibrium-relative price of X in isolation is $P_A = P_X/P_Y = 1/4$ in Nation 1 and $P_{A'} = P_X/P_Y = 4$ in Nation 2 (see Figure 3.3). Relative prices are different in the two nations because their production frontiers and indifference curves differ in shape and location.

CASE STUDY 3-1 Comparative Advantage of the Largest Advanced and Emerging Economies

Table 3.1 gives some of the manufactured products in which the United States, the European Union, Japan, China, and Brazil have a comparative advantage (i.e., in which they had a trade surplus) in 2010.

TABLE 3.1. The Comparative Advantage of the United States, European Union, Japan, China, Brazil, and Korea in 2010

United States: Chemicals other than pharmaceuticals, aircraft, integrated circuits, nonelectrical machinery, and scientific and controlling instruments
European Union: Iron and steel, chemicals (including pharmaceuticals), transport equipment (automobiles and aircraft), all types of machinery, and scientific and controlling instruments
Japan: Iron and steel, chemicals other than pharmaceuticals, office and telecom equipment and most other types of machinery, automobiles and other transport equipment, and scientific and controlling instruments
China: Iron and steel, pharmaceuticals, office and telecom equipment and most other types of machinery other than integrated circuits, transport equipment other than automobiles, power generating and electrical machinery, textiles and clothing, and personal household goods
Brazil: Iron and steel, and transport equipment other than automobiles, and personal and household goods

Source: World Trade Organization, *International Trade Statistics* (Geneva: WTO, 2011).

Since in isolation $P_A < P_A{}'$ Nation 1 has a comparative advantage in commodity X and Nation 2 in commodity Y. It follows that both nations can gain if Nation 1 specializes in the production and export of X in exchange for Y from Nation 2. How this takes place will be seen in the next section.

Figure 3.3 illustrates that the forces of supply (as given by the nation's production frontier) and the forces of demand (as summarized by the nation's indifference map) *together* determine the equilibrium-relative commodity prices in each nation in autarky. For example, if indifference curve I had been of a different shape, it would have been tangent to the production frontier at a different point and would have determined a different relative price of X in Nation 1. The same would be true for Nation 2. This is in contrast to the constant costs case, where the equilibrium P_X/P_Y is constant in each nation regardless of the level of output and conditions of demand, and is given by the constant slope of the nation's production frontier.

Case Study 3-1 gives the comparative advantage of the largest advanced and emerging market economies in manufactured products.

3.5 The Basis for and the Gains from Trade with Increasing Costs

A difference in relative commodity prices between two nations is a reflection of their comparative advantage and forms the basis for mutually beneficial trade. The nation with the lower relative price for a commodity has a comparative advantage in that commodity and a comparative disadvantage in the other commodity, with respect to the second nation. Each nation should then specialize in the production of the commodity of its comparative advantage (i.e., produce more of the commodity than it wants to consume domestically) and exchange part of its output with the other nation for the commodity of its comparative disadvantage.

However, as each nation specializes in producing the commodity of its comparative advantage, it incurs increasing opportunity costs. Specialization will continue until relative commodity prices in the two nations become equal at the level at which trade is in equilibrium. By then trading with each other, both nations end up consuming more than in the absence of trade.

3.5A Illustrations of the Basis for and the Gains from Trade with Increasing Costs

We have seen (Figure 3.3) that in the absence of trade the equilibrium-relative price of X is $P_A = \frac{1}{4}$ in Nation 1 and $P_{A'} = 4$ in Nation 2. Thus, Nation 1 has a comparative advantage in commodity X and Nation 2 in commodity Y.

Suppose that trade between the two nations becomes possible (e.g., through the elimination of government obstacles to trade or a drastic reduction in transportation costs). Nation 1 should now specialize in the production and export of commodity X in exchange for commodity Y from Nation 2. How this takes place is illustrated by Figure 3.4.

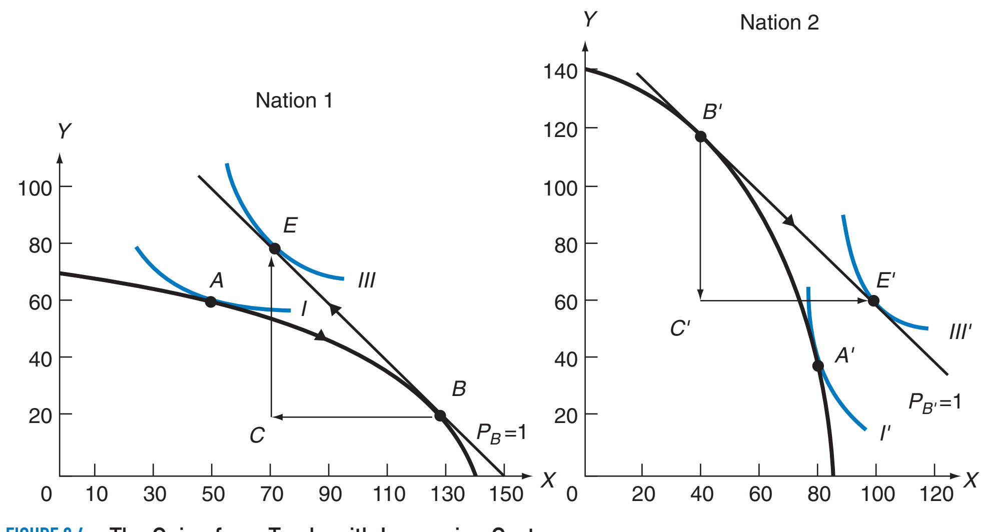

FIGURE 3.4. The Gains from Trade with Increasing Costs.
With trade, Nation 1 moves from point *A* to point *B* in production. By then exchanging 60X for 60Y with Nation 2 (see trade triangle *BCE*), Nation 1 ends up consuming at point *E* (on indifference curve III). Thus, Nation 1 gains 20X and 20Y from trade (compare autarky point *A* with point *E*). Similarly, Nation 2 moves from A' to B' in production. By then exchanging 60Y for 60X with Nation 1 (see trade triangle $B'C'E'$), Nation 2 ends up consuming at point E' and also gains 20X and 20Y. $P_B = P_{B'} = 1$ is the equilibrium-relative price—the price at which trade is balanced.

Starting from point A (the equilibrium point in isolation), as Nation 1 specializes in the production of X and moves *down* its production frontier, it incurs increasing opportunity costs in the production of X. This is reflected in the increasing *slope* of its production frontier. Starting from point A', as Nation 2 specializes in the production of Y and moves *upward* along its production frontier, it experiences increasing opportunity costs in the production of Y. This is reflected in the *decline in the slope* of its production frontier (a reduction in the opportunity cost of X, which means a rise in the opportunity cost of Y).

This process of specialization in production continues until relative commodity prices (the slope of the production frontiers) become equal in the two nations. The common relative price (slope) with trade will be somewhere between the pretrade relative prices of ¼ and 4, at the level at which trade is balanced. In Figure 3.4, this is $P_B = P_{B'} = 1$.

With trade, Nation 1 moves from point A down to point B in production. By then exchanging 60X for 60Y with Nation 2 (see trade triangle BCE), Nation 1 ends up consuming at point E (70X and 80Y) on its indifference curve III. This is the highest level of satisfaction that Nation 1 can reach with trade at $P_X/P_Y = 1$. Thus, Nation 1 gains 20X and 20Y from its no-trade equilibrium point. (Compare point E on indifference curve III with point A on indifference curve I.) Line BE is called the *trade possibilities line* or, simply, *trade line* because trade takes place along this line.

Similarly, Nation 2 moves from point A' up to point B' in production, and, by exchanging 60Y for 60X with Nation 1 (see trade triangle $B'C'E'$), it ends up consuming at point E' (100X and 60Y) on its indifference curve III$'$. Thus, Nation 2 also gains 20X and 20Y from specialization in production and trade.

Note that with specialization in production and trade, each nation can consume outside its production frontier (which also represents its no-trade consumption frontier).

3.5B Equilibrium-Relative Commodity Prices with Trade

The equilibrium-relative commodity price with trade is the common relative price in both nations at which trade is balanced. In Figure 3.4, this is $P_B = P_{B'} = 1$. At this relative price, the amount of X that Nation 1 wants to export (60X) equals the amount of X that Nation 2 wants to import (60X). Similarly, the amount of Y that Nation 2 wants to export (60Y) exactly matches the amount of Y that Nation 1 wants to import at this price (60Y).

Any other relative price could not persist because trade would be unbalanced. For example, at $P_X/P_Y = 2$, Nation 1 would want to export more of X than Nation 2 would be willing to import at this high price. As a result, the relative price of X would fall toward the equilibrium level of 1. Similarly, at a relative price of X lower than 1, Nation 2 would want to import more of X than Nation 1 would be willing to export at this low price, and the relative price of X would rise. Thus, the relative price of X would gravitate toward the equilibrium price of 1. (The same conclusion would be reached in terms of Y.)

The equilibrium-relative price in Figure 3.4 was determined by trial and error; that is, various relative prices were tried until the one that balanced trade was found. There is a more rigorous theoretical way to determine the equilibrium-relative price with trade. This makes use of either the total demand and supply curve of each commodity in each nation or the so-called offer curves, and is discussed in the next chapter.

All we need to say at this point is that the greater Nation 1's desire is for Y (the commodity exported by Nation 2) and the weaker Nation 2's desire is for X (the commodity exported by Nation 1), the closer the equilibrium price with trade will be to ¼ (the pretrade equilibrium price in Nation 1) and the smaller will be Nation 1's share of the gain. Once the equilibrium-relative price with trade is determined, we will know exactly how the gains from trade are divided between the two nations, and our trade model will be complete. In Figure 3.4, the equilibrium-relative price of X with trade ($P_B = P_{B'} = 1$) results in equal gains (20X and 20Y) for Nation 1 and Nation 2, but this need not be the case.

Of course, if the *pretrade-relative* price had been the same in both nations (an unlikely occurrence), there would be no comparative advantage or disadvantage to speak of in either nation, and no specialization in production or mutually beneficial trade would take place.

3.5c Incomplete Specialization

There is one basic difference between our trade model under increasing costs and the constant opportunity costs case. Under constant costs, both nations specialize completely in production of the commodity of their comparative advantage (i.e., produce only that commodity). For example, in Figures 2.2 and 2.3, the United States specialized completely in wheat production, and the United Kingdom specialized completely in cloth production. Since it paid for the United States to exchange some wheat for British cloth, it paid for the United States to obtain *all* of its cloth from the United Kingdom in exchange for wheat because the opportunity cost of wheat remained constant in the United States. The same was true for the United Kingdom in terms of cloth production.

In contrast, under increasing opportunity costs, there is incomplete specialization in production in both nations. For example, while Nation 1 produces more of X (the commodity of its comparative advantage) with trade, it continues to produce some Y (see point B in Figure 3.4). Similarly, Nation 2 continues to produce some X with trade (see point B' in Figure 3.4).

The reason for this is that as Nation 1 specializes in the production of X, it incurs increasing opportunity costs in producing X. Similarly, as Nation 2 produces more Y, it incurs increasing opportunity costs in Y (which means declining opportunity costs of X). Thus, as each nation specializes in producing the commodity of its comparative advantage, relative commodity prices move toward each other (i.e., become less unequal) until they are identical in both nations.

At that point, it does not pay for either nation to continue to expand production of the commodity of its comparative advantage (see Case Study 3-2). This occurs before either nation has completely specialized in production. In Figure 3.5, $P_B = P_B{}' = 1$ before Nation 1 or Nation 2 has completely specialized in production.

CASE STUDY 3-2 Specialization and Export Concentration in Selected Countries

Because of increasing costs, no nation specializes completely in the production of only one product in the real world. The closest to complete specialization in production and trade that any nation comes is Kuwait, where petroleum exports represented 92.1 percent of the total value of its exports in 2010. For Argentina, another developing nation with highly specialized natural

(continued)

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CASE STUDY 3-2 Continued

resources, food exports represent 49.5 percent of its total exports. Table 3.2 shows that the largest export product of the United States, and the 27-member European Union (EU-27), represents less than 16 percent of their total exports. The figure is between 19 and 21 percent in Japan and Korea, and 28 and 30 percent in China and Brazil.

TABLE 3.2. Leading Export as a Percentage of Total Exports of Selected Countries in 2010

United States	Chemicals	14.8
European Union	Chemicals	15.8
Japan	Automotive products	19.4
Korea	Office and telecommunications equipment	25.7
China	Office and telecommunications equipment	28.5
Brazil	Food	30.1
Argentina	Food	49.5
Kuwait	Fuels	92.1

Source: World Trade Organization, *International Trade Statistics* (Geneva: WTO, 2011).

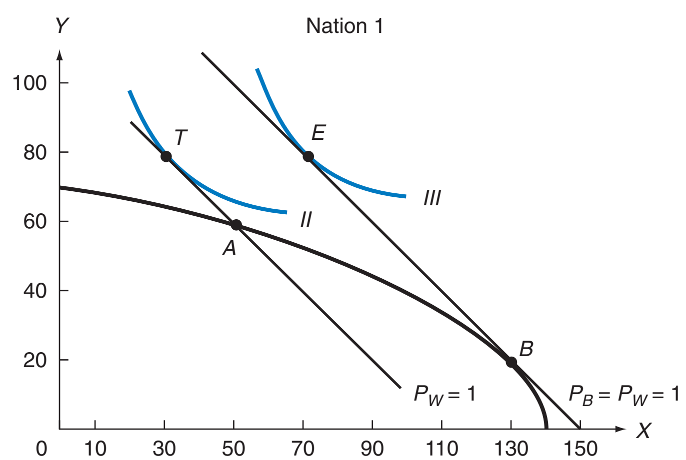

FIGURE 3.5. The Gains from Exchange and from Specialization.
If Nation 1 could not specialize in the production of X with the opening of trade but continued to produce at point *A*, Nation 1 could export 20X in exchange for 20Y at the prevailing world price of $P_W = 1$ and end up consuming at point *T* on indifference curve II. The increase in consumption from point *A* (in autarky) to point *T* represents the gains from exchange alone. If Nation 1 subsequently did specialize in the production of X and produced at point *B*, it would then consume at point *E* on indifference curve III. The increase in consumption from *T* to *E* would represent the gains from specialization in production.

3.5D Small-Country Case with Increasing Costs

Recall that under constant costs, the only exception to complete specialization in production occurred in the small-country case. There, only the small nation specialized completely in production of the commodity of its comparative advantage. The large nation continued to produce both commodities even with trade (see Figure 2.3) because the small nation could not satisfy all of the demand for imports of the large nation. In the increasing costs case, however, we find incomplete specialization even in the small nation.

We can use Figure 3.4 to illustrate the small-country case with increasing costs. Let us assume that Nation 1 is now a very small country, which is in equilibrium at point A (the same as before) in the absence of trade, and that Nation 2 is a very large country or even the rest of the world. (The diagram for Nation 2 in Figure 3.4 is to be completely disregarded in this case.)

Suppose that the equilibrium-relative price of X on the world market is $1 (P_W = 1)$, and it is not affected by trade with small Nation 1. Since in the absence of trade, the relative price of X in Nation 1 ($P_A = 1/4$) is lower than the world market price, Nation 1 has a comparative advantage in X. With the opening of trade, Nation 1 specializes in the production of X until it reaches point B on its production frontier, where $P_B = 1 = P_W$. Even though Nation 1 is now considered to be a small country, it still does not specialize completely in the production of X (as would be the case under constant costs).

By exchanging 60X for 60Y, Nation 1 reaches point E on indifference curve III and gains 20X and 20Y (compared with its autarky point A on indifference curve I). Note that this is exactly what occurred when Nation 1 was *not* considered to be small. The only difference is that now Nation 1 does not affect relative prices in Nation 2 (or the rest of the world), and Nation 1 captures all the benefits from trade (which now amount to only 20X and 20Y).

3.5E The Gains from Exchange and from Specialization

A nation's gains from trade can be broken down into two components: the gains from exchange and the gains from specialization. Figure 3.5 illustrates this breakdown for *small* Nation 1. (For simplicity, the autarky price line, $P_A = 1/4$, and indifference curve I are omitted from the figure.)

Suppose that, for whatever reason, Nation 1 could *not* specialize in the production of X with the opening of trade but continued to produce at point A, where MRT $= 1/4$. Starting from point A, Nation 1 could export 20X in exchange for 20Y at the prevailing world relative price of $P_W = 1$ and end up consuming at point T on indifference curve II. Even though Nation 1 consumes less of X and more of Y at point T in relation to point A, it is better off than it was in autarky because T is on higher indifference curve II. The movement from point A to point T in consumption measures the gains from exchange.

If subsequently Nation 1 also specialized in the production of X and produced at point B, it could then exchange 60X for 60Y with the rest of the world and consume at point E on indifference curve III (thereby gaining even more). The movement from T to E in consumption measures the gains from specialization in production.

In sum, the movement from A (on indifference curve I) to T (on indifference curve II) is made possible by exchange alone. This takes place even if Nation 1 remains at point A (the autarky point) in production. The movement from point T to E (on indifference curve III) represents the gains resulting from specialization in production.

Note that Nation 1 is not in equilibrium in production at point A with trade because MRT $< P_W$. To be in equilibrium in production, Nation 1 should expand its production of X until it reaches point B, where $P_B = P_W = 1$. Nation 2's gains from trade can similarly be broken down into gains from exchange and gains from specialization.

Case Study 3-3 illustrates the reallocation of labor in the United States as a real-world example of comparative advantage at work, while Case Study 3-4 shows that deindustrialization in the industrial countries as a group, in the United States, in the European Union, and in Japan was due mainly to increases in labor productivity or internal causes rather than foreign trade. During the past decade, however, huge trade deficits as well as the electronic revolution have led to many more job losses than gains in the United States.

CASE STUDY 3-3 Job Losses in High U.S. Import-Competing Industries

Table 3.3 shows the number of workers who lost their jobs (i.e., were displaced) in various high import-competing industries in the United States between 1979 and 1999. High import-competing industries were broadly defined as those in the top 25 percent in import shares. From the table, we see that almost 6.5 million workers lost their jobs in these industries over the 1979–1999 period, with the electrical machinery and apparel industries leading the list, with 1,181,000 and 1,136,000 jobs lost, respectively.

More recently, the AFL-CIO estimated that the nation has lost more than 2.5 million manufacturing jobs and more than 850,000 professional service and information sector jobs from 2001 to 2004. Forrester Research Inc. estimated that 588,000 U.S. jobs have been going overseas annually from 2005 to 2009 and predicts that U.S. employers will move another 3.4 million white-collar jobs overseas by 2015. As Case Study 3-4 shows, however, only a small fraction of these job losses were due to imports, as such. Most were lost to technological change and outsourcing.

TABLE 3.3. Job Losses in High Import-Competing Industries

Industry	Jobs Lost (thousands)	Industry	Jobs Lost (thousands)
Electrical machinery	1,181	Textiles	159
Apparel	1,136	Toys and sporting goods	156
Motor vehicles	918	Primary metals other than steel	133
Electronic computing equipment	513	Photographic equipment	68
Radio and television	395	Leather products	57
Steel	361	Office and accounting machines	41
Construction machinery	351	Pottery and related products	24
Tires and other rubber products	193	Watches and clocks	9
Footwear	184	Leather, tanning and finishing	5
Scientific instruments	164	Other industries	406
		Total	6,454

Sources: L. G. Kletzer, *Job Loss from Imports: Measuring the Costs* (Washington, D.C.: Institute for International Economics, 2001), pp. 18–19; AFL-CIO, ''Exporting America'' 2010, http://www.aflcio.org/issues/exporting america/outsourcing_problems.cfm; Forrester Research Inc., *Biz India Magazine*, December 26, 2009; and ''The Factory Floor Has a Ceiling on Job Creation,'' *The Wall Street Journal*, January 12, 2012, p. A6.

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CASE STUDY 3-4 International Trade and Deindustrialization in the United States, the European Union, and Japan

Since the 1970s, most advanced economies have been concerned with the problem of *deindustrialization*, as reflected in their declining share of manufacturing employment. Table 3.4 shows the relative importance of the different factors accounting for deindustrialization in all advanced countries as a group, in the United States, in the European Union, and in Japan, from 1970 to 1994.

Table 3.4 shows that the overall share of manufacturing employment declined by about 10 percentage points in all industrial countries, as a group, and in the United States and in the European Union, and by about 4 percentage points in Japan. The table also shows, however, that most of this decline resulted from the growth of labor productivity (which made possible higher levels of output with less labor) and less as a result of the decline in the rate of investments and other domestic forces. International trade actually resulted in an increase in industrial employment (the negative signs indicate the opposite of deindustrialization), except in the United States (where it led to a 9.6 percentage point decline in manufacturing employment). During the past decade, however, huge trade deficits as well as the electronic revolution and outsourcing have led to many more job losses than gains in the United States. In fact, the percentage of the labor force in U.S. manufacturing declined from 30 percent in the 1970s to about 12 percent in 2012. This topic is explored further in Chapters 5, 8, and 9 of the text.

TABLE 3.4. Factors Responsible for Deindustrialization

	Industrial Countries	United States	European Union	Japan
Share of manufacturing Employment (in percent)				
1970	27.6	26.4	30.4	27.0
1994	18.0	16.0	20.2	23.2
Change	−9.6	−10.4	−10.2	−3.8
Percentage change due to:				
Productivity growth	65.6	65.4	59.8	157.9
Investment	18.8	3.8	20.6	71.1
Trade	(−)2.1	9.6	(−)2.9	(−)30.0
Other	17.7	21.2	22.5	(−)51.7
Total	100.0	100.0	100.0	100.0

Sources: International Monetary Fund, *Staff Studies for the World Economic Outlook*, Washington, D.C., December 1997, p. 68; R. E. Scott, ''Costly Trade with China,'' *Briefing Paper #188*, Economic Policy Institute, October 9, 2007; ''Pain from Free Trade Spurs Second Thoughts,'' *The Wall Street Journal*, March 28, 2008, p. A1; ''Is U.S. Manufacturing Falling off the Radar Screen,'' *The New York Times*, September 10, 2010, p. 1; and ''The Factory Floor Has a Ceiling on Job Creation,'' *The Wall Street Journal*, January 12, 2012, p. A6.

3.6 Trade Based on Differences in Tastes

The difference in *pretrade-relative* commodity prices between Nation 1 and Nation 2 in Figures 3.3 and 3.4 was based on the difference in the production frontiers and indifference curves in the two nations. This determined the comparative advantage of each nation and set the stage for specialization in production and mutually beneficial trade.

With increasing costs, even if two nations have identical production possibility frontiers (which is unlikely), there will still be a basis for mutually beneficial trade if tastes, or demand preferences, in the two nations differ. The nation with the relatively smaller demand or preference for a commodity will have a lower autarky-relative price for, and a comparative advantage in, that commodity. The process of specialization in production and trade would then follow, exactly as described in the previous section.

3.6A Illustration of Trade Based on Differences in Tastes

Trade based solely on differences in tastes is illustrated in Figure 3.6. Since the production frontiers of the two nations are now assumed to be identical, they are represented by a single

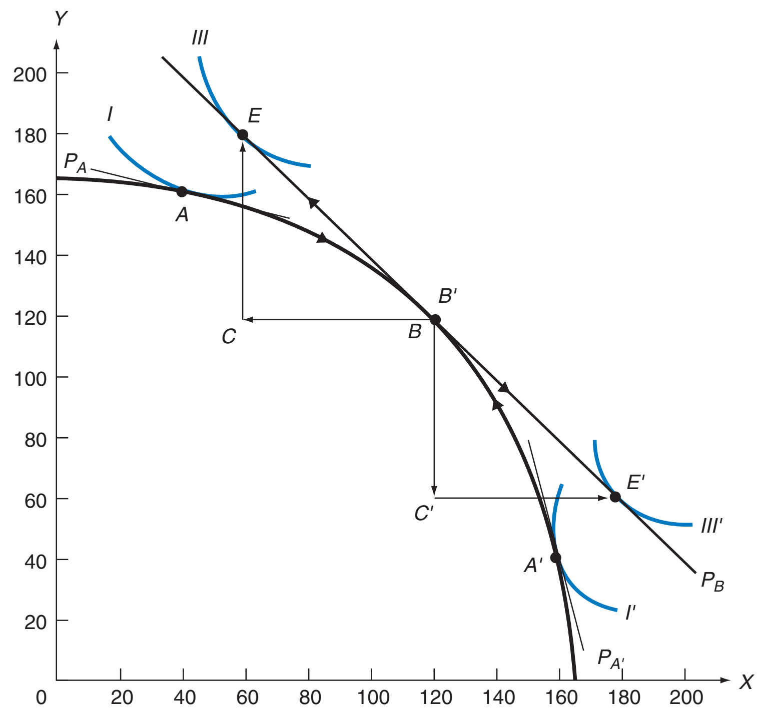

FIGURE 3.6. Trade Based on Differences in Tastes.
Nations 1 and 2 have identical production frontiers (shown by a single curve) but different tastes (indifference curves). In isolation, Nation 1 produces and consumes at point *A* and Nation 2 at point *A*′. Since $P_A < P_A{}'$, Nation 1 has a comparative advantage in X and Nation 2 in Y. With trade, Nation 1 specializes in the production of X and produces at *B*, while Nation 2 specializes in Y and produces at *B*′ (which coincides with *B*). By exchanging 60X for 60Y with each other (see trade triangles *BCE* and *B*′*C*′*E*′), Nation 1 ends up consuming at *E* (thereby gaining 20X and 20Y), while Nation 2 consumes at *E*′ (and also gains 20X and 20Y).

curve. With indifference curve I tangent to the production frontier at point A for Nation 1 and indifference curve I′ tangent at point A' for Nation 2, the pretrade-relative price of X is lower in Nation 1. Thus, Nation 1 has a comparative advantage in commodity X and Nation 2 in commodity Y.

With the opening of trade, Nation 1 specializes in the production of X (and moves down its production frontier), while Nation 2 specializes in Y (and moves up its own production frontier). Specialization continues until P_X/P_Y is the same in both nations and trade is balanced. This occurs at point B (which coincides with point B′), where $P_B = P_{B'} = 1$. Nation 1 then exchanges 60X for 60Y with Nation 2 (see trade triangle BCE) and ends up consuming at point E on its indifference curve III. Nation 1 thus gains 20X and 20Y as compared with point A. Similarly, Nation 2 exchanges 60Y for 60X with Nation 1 (see trade triangle B′C′E′) and ends up consuming at point E′ on its indifference curve III′ (also gaining 20X and 20Y from point A′). Note that when trade is based solely on taste differences, the patterns of production become more similar as both nations depart from autarky.

Thus, mutually beneficial trade can be based exclusively on a difference in tastes between two nations. In Chapter 5, we will examine the opposite case, where trade between the two nations is based exclusively on a difference in factor endowments and production frontiers. (This will be referred to as the Heckscher–Ohlin model.) Only if the production frontier and the indifference curves are identical in both nations (or the difference in production frontiers is exactly neutralized, or offset, by the difference in the indifference curves) will the pretrade-relative commodity prices be equal in both nations, ruling out the possibility of mutually beneficial trade.

SUMMARY

1. This chapter extended our simple trade model to the more realistic case of increasing opportunity costs. It also introduced demand preferences in the form of community indifference curves. We then went on to examine how the interaction of these forces of demand and supply determines each nation's comparative advantage and sets the stage for specialization in production and mutually beneficial trade.

2. Increasing opportunity costs mean that the nation must give up more and more of one commodity to release just enough resources to produce each additional unit of another commodity. This is reflected in a production frontier that is concave from the origin. The slope of the production frontier gives the marginal rate of transformation (MRT). Increasing opportunity costs arise because resources are not homogeneous and are not used in the same fixed proportion in the production of all commodities. Production frontiers differ because of different factor endowments and/or technology in different nations.

3. A community indifference curve shows the various combinations of two commodities that yield equal satisfaction to the community or nation. Higher curves refer to a greater level of satisfaction. Community indifference curves are negatively sloped and convex from the origin. And to be useful, they must not cross. The slope of an indifference curve gives the marginal rate of substitution (MRS) in consumption, or the amount of commodity Y that a nation could give up for each extra unit of commodity X and still remain on the same indifference curve. Trade affects the income distribution within a nation and can result in intersecting indifference curves. This difficulty can be overcome by the compensation principle, which states that the nation gains from trade if the gainers would retain some of their gain even after fully compensating losers for their losses. Alternatively, some restrictive assumptions could be made.

4. In the absence of trade, a nation is in equilibrium when it reaches the highest indifference curve possible with its production frontier. This occurs at the point where a community indifference curve is tangent to the nation's production frontier. The common slope of the two curves at the tangency point gives the internal equilibrium-relative commodity price in the nation and reflects the nation's comparative advantage.

5. With trade, each nation specializes in producing the commodity of its comparative advantage and faces increasing opportunity costs. Specialization in production proceeds until relative commodity prices in the two nations are equalized at the level at which trade is in equilibrium. By then trading, each nation ends up consuming on a higher indifference curve than in the absence of trade. With increasing costs, specialization in production is incomplete, even in a small nation. The gains from trade can be broken down into gains from exchange and gains from specialization in production.

6. With increasing costs, even if two nations have identical production frontiers, there is still a basis for mutually beneficial trade if tastes, or demand or preferences, differ in the two nations. The nation with the relatively smaller demand or preference for a commodity will have a lower autarky-relative price for, and a comparative advantage in, that commodity. This will set the stage for specialization in production and mutually beneficial trade, as described earlier.

A LOOK AHEAD

In Chapter 4, we introduce the demand curve for imports and the supply curve of exports, as well as the offer curve of each nation, in order to examine precisely how the equilibrium-relative commodity price and terms of trade of each nation are determined with trade. We can then determine how the gains from trade are shared by each nation. With this addition, our simple trade model will be complete. In Chapter 5, we will see how this simple trade model was extended by Heckscher and Ohlin.

KEY TERMS

Autarky, p. 62
Community indifference curve, p. 60
Deindustrialization, p. 70
Equilibrium-relative commodity price in isolation, p. 63
Equilibrium-relative commodity price with trade, p. 66
Gains from exchange, p. 69
Gains from specialization, p. 69
Incomplete specialization, p. 67
Increasing opportunity costs, p. 58
Marginal rate of substitution (MRS), p. 61
Marginal rate of transformation (MRT), p. 59

QUESTIONS FOR REVIEW

1. In what way is the material in this chapter more realistic than that of Chapter 2?

2. How are the tastes, or demand preferences, of a nation introduced in this chapter? Why are they needed?

3. Why does a production frontier that is concave from the origin indicate increasing opportunity costs in both commodities? What does the slope of the production frontier measure? How does the slope change as the nation produces more of the commodity measured along the horizontal axis? more of the commodity measured along the vertical axis?

4. What is the reason for increasing opportunity costs? Why do the production frontiers of different nations have different shapes?

5. What does a community indifference curve measure? What are its characteristics? What does the slope of an indifference curve measure? Why does

it decline as the nation consumes more of the commodity measured along the horizontal axis?

6. What difficulties arise in the use of community indifference curves in trade theory? How can these difficulties be overcome?

7. What is meant by the equilibrium-relative commodity price in isolation? How is this price determined in each nation? How does it define the nation's comparative advantage?

8. Why does specialization in production with trade proceed only up to the point where relative commodity prices in the two nations are equalized? How is the equilibrium-relative commodity price with trade determined?

9. Why is there incomplete specialization in production (even in a smaller nation) with increasing opportunity costs? How are the results under increasing costs different from the fixed-costs case?

10. What is meant by gains from exchange? by gains from specialization?

11. Can specialization in production and mutually beneficial trade be based solely on a difference in tastes between two nations? How is this different from the more general case?

12. Can specialization in production and mutually beneficial trade be based exclusively on a difference in factor endowments and/or technology between two nations?

PROBLEMS

1. On one set of axes, sketch a fairly large production frontier concave from the origin.

(a) Starting near the midpoint on the production frontier, use arrows to show that the nation incurs increasing opportunity costs in producing more of X (the commodity measured along the horizontal axis) and more of Y.

(b) How does the slope of the production frontier change as the nation produces more of X? more of Y? What do these changes reflect?

2. On another set of axes, sketch three community indifference curves, making the top two curves cross each other.

(a) Why have you drawn community indifference curves downward, or negatively, sloped?

(b) What does the slope of the curves measure? Why is the slope of each curve smaller for lower points?

(c) Which of the two intersecting indifference curves shows a greater level of satisfaction to the right of the point of intersection? to the left? Why is this inconsistent with the definition of indifference curves? What conclusion can you reach?

***3.** On one set of axes, sketch a community indifference curve tangent to the fairly flat section of a concave production frontier. On a second set of axes, sketch another (different) community indifference curve tangent to the fairly steep portion of another (different) concave production frontier.

(a) Draw in the line showing the equilibrium-relative commodity price in isolation in each nation.

(b) Which is the commodity of comparative advantage for each nation?

(c) Under what (unusual) condition would there be no such thing as comparative advantage or disadvantage between the two nations?

***4.** **(a)** On the graphs of Problem 3, show, for each nation with trade, the direction (by an arrow on the production frontier) of specialization in production and the equilibrium point of production and consumption.

(b) How much does each nation gain in consumption compared with its autarky point? Which of the two nations gains more from trade? Why?

5. On one set of axes, sketch Nation 1's supply of exports of commodity X so that the quantity supplied *(QS)* of X is $QS_x = 0$ at $P_X/P_Y = 1/4$, $QS_x = 40$ at $P_X/P_Y = 1/2$, $QS_x = 60$ at $P_X/P_Y = 1$, and $QS_x = 70$ at $P_X/P_Y = 1\frac{1}{2}$. On the same set of axes,

* = Answer provided at www.wiley.com/college/salvatore.

sketch Nation 2's demand for Nation 1's exports of commodity X so that the quantity demanded *(QD)* of X is $QD_x = 40$ at $P_X/P_Y = 1\frac{1}{2}$, $QD_x = 60$ at $P_X/P_Y = 1$, and $QD_x = 120$ at $P_X/P_Y = \frac{1}{2}$.

(a) Determine the equilibrium-relative commodity price of the exports of commodity X with trade.

(b) What would happen if P_X/P_Y were $1\frac{1}{2}$

(c) What would happen if $P_X/P_Y = \frac{1}{2}$

6. What is the relationship between the figure you sketched for Problem 5 and the results you obtained in Problem 5 and Figure 3.4 in the text? Explain.

***7.** On one set of axes, sketch a community indifference curve tangent to the fairly flat section of a concave production frontier and show the nation's autarky equilibrium-relative commodity price, labeling it P_A. Assume that this graph refers to a very small nation whose trade does not affect relative prices on the world market, given by P_W. Show on the graph the process of specialization in the production, the amount traded, and the gains from trade.

8. **(a)** Explain why the small nation of Problem 7 does not specialize completely in the production of the commodity of its comparative advantage.

(b) How does your answer to part (a) differ from the constant-cost case?

9. On two sets of axes, draw identical concave production frontiers with different community indifference curves tangent to them.

(a) Indicate the autarky equilibrium-relative commodity price in each nation.

(b) Show the process of specialization in production and mutually beneficial trade.

10. What would have happened if the two community indifference curves had also been identical in Problem 9? Sketch a graph of this situation.

11. What would happen if the production frontiers are identical and the community indifference curves are different, but we have constant opportunity costs? Draw a graph of this.

12. Draw a figure showing the separation of the gains from exchange from the gains from specialization for Nation 2 in the right panel of Figure 3.4 if Nation 2 were now a small nation.

13. During the negotiations for NAFTA (North American Free Trade Agreement among the United States, Canada, and Mexico) in the early 1990s, opponents argued that the United States would lose many jobs to Mexico because of the much lower wages in Mexico. What was wrong with this line of reasoning?

APPENDIX

In this appendix, we review those aspects of production theory that are essential for understanding the material presented in subsequent appendices. We begin with a review of production functions, isoquants, isocosts, and equilibrium. We then illustrate these concepts for two nations, two commodities, and two factors. Next, we derive the Edgeworth box diagram and, from it, the production frontier of each nation. Finally, we use the Edgeworth box diagram to show the change in the ratio of resource use as each nation specializes in production with trade.

A3.1 Production Functions, Isoquants, Isocosts, and Equilibrium

A production function gives the *maximum* quantities of a commodity that a firm can produce with various amounts of factor inputs. This purely technological relationship is supplied by engineers and is represented by isoquants.

An isoquant is a curve that shows the various combinations of two factors, say, capital (K) and labor (L), that a firm can use to produce a specific level of output. Higher isoquants refer to larger outputs and lower ones to smaller outputs. Isoquants have the same general characteristics as indifference curves. They are negatively sloped, convex from the origin, and do not cross. (However, isoquants give a cardinal measure of output, while indifference curves give only an ordinal measure of utility.)

Isoquants are negatively sloped because a firm using less K must use more L to remain on the same isoquant. The (absolute) slope of the isoquant is called the marginal rate of technical substitution of labor for capital in production (MRTS) and measures how much K the firm can give up by increasing L by one unit and still remain on the same isoquant. As a firm moves down an isoquant and uses more L and less K, it finds it more and more difficult to replace K with L. That is, the marginal rate of technical substitution of L for K (or slope of the isoquant) diminishes. This makes the isoquant convex from the origin. Finally, isoquants do not cross because an intersection would imply the same level of output on two isoquants, which is inconsistent with their definition.

In Figure 3.7, the curve labeled $1X$ is the isoquant for one arbitrarily defined unit of commodity X, and curve $2X$ is the isoquant for two units of X. Note that the isoquants are negatively sloped and convex from the origin and that they do not cross.

An isocost is a line that shows the various combinations of K and L that a firm can hire for a given expenditure, or total outlay *(TO)*, at given factor prices. For example, suppose that the total outlay of the firm in Figure 3.7 is $TO = \$30$, that the price of a unit of capital is $P_K = \$10$, and that the wage rate is $P_L = \$5$. Under these conditions, the firm can hire either $3K$ (the vertical intercept) or $6L$ (the horizontal intercept) or any combination of L and K shown on the straight line (isocost). The (absolute) slope of the isocost of $3/6 = 1/2$ gives the relative price of L (the factor plotted along the horizontal axis). That is, $P_L/P_K = \$5/\$10 = 1/2$. A $TO = \$60$ and unchanged factor prices give a new isocost parallel to the first one and twice as far from the origin (see Figure 3.7).

A producer is in equilibrium when it maximizes output for a given cost outlay (i.e., when it reaches the highest isoquant possible with a given isocost). This occurs where an

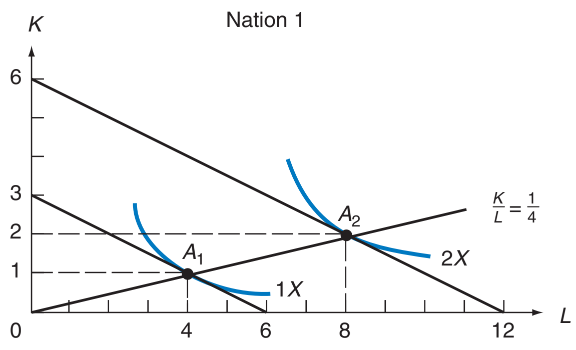

FIGURE 3.7. Isoquants, Isocosts, and Equilibrium.
Isoquants 1X and 2X give the various combinations of K and L that the firm can use to produce one and two units of X, respectively. Isoquants are negatively sloped, convex, and do not cross. An *isocost* shows the various amounts of K and L that a firm can hire with a given total outlay (TO). The lines from $3K$ to $6L$ and from $6K$ to $12L$ are isocosts. The (absolute) slope of the isocost measures P_L/P_K. Equilibrium is at points A_1 and A_2, where the firm reaches the highest isoquant possible for a given TO. At A_2 the firm produces twice as much output and uses twice as much K and L as at A_1. The straight line through the origin joining A_1 and A_2 is the *expansion path* and gives the constant $K/L = 1/4$ ratio in producing 1X and 2X.

isoquant is tangent to an isocost (i.e., MRTS $= P_L/P_K$). In Figure 3.7, the producer is in equilibrium at point A_1, producing $1X$ with the lower isocost, and at point A_2, producing $2X$ with the higher isocost. Note that isoquant $2X$ involves twice as much output as isoquant $1X$, is twice as far from the origin, and requires twice as much outlay of K and L to be reached. The straight line from the origin connecting equilibrium points A_1 and A_2 is called the expansion path and shows the constant $K/L = \frac{1}{4}$ in producing $1X$ and $2X$.

A production function, such as the one above, that has a straight-line expansion path and that shows that increasing inputs in a given proportion results in output increasing in the same proportion is a Cobb–Douglas production function that is homogeneous of degree 1 and exhibits constant returns to scale. We will make much use of this production function in international economics because of its useful properties. Since the K/L ratio remains the same with this production function (as long as factor prices do not change), the productivity of K and L also remains the same, regardless of the level of output. Furthermore, with this type of production function, all the isoquants that refer to the production of various quantities of a particular commodity look exactly alike or have identical shape (see Figure 3.7). As a result, the elasticity of substitution of labor for capital (which measures the degree by which labor can be substituted for capital in production as the price of labor or the wage rate falls) is equal to 1. (This is examined in detail in Appendix A5.6.)

A3.2 Production Theory with Two Nations, Two Commodities, and Two Factors

Figure 3.8 extends Figure 3.7 to deal with the case of two nations, two commodities, and two factors. Figure 3.8 shows isoquants for commodity X and commodity Y for Nation 1 and Nation 2. Note that commodity Y is produced with a higher K/L ratio in both nations.

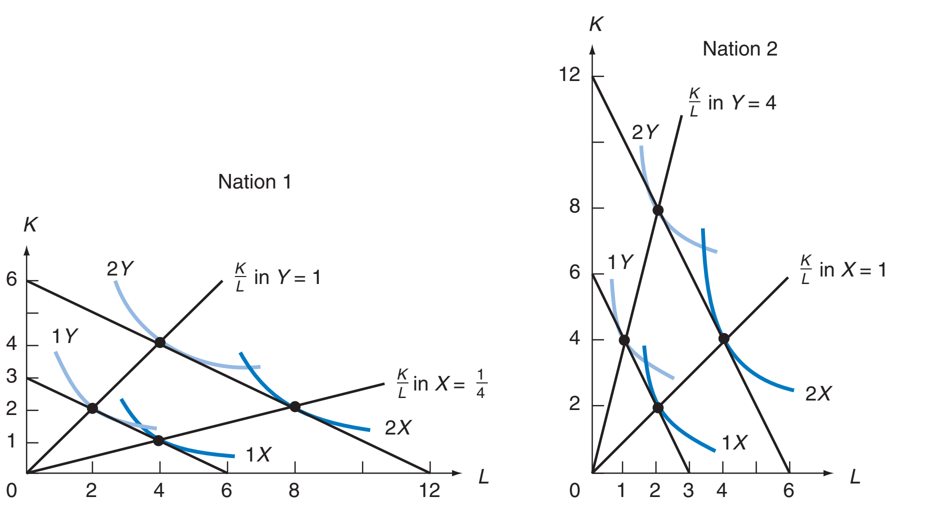

FIGURE 3.8. Production with Two Nations, Two Commodities, and Two Factors.
Y is the K-intensive commodity in both nations. The K/L ratio is lower in Nation 1 than in Nation 2 in both X and Y because P_L/P_K is lower in Nation 1. Since Y is always the K-intensive commodity and X is always the L-intensive commodity in both nations, the X and Y isoquants intersect only once in each nation.

Thus, we say that Y is K-intensive and X is the L-intensive commodity. Note also that the K/L ratio is lower in Nation 1 than in Nation 2 for both X and Y. The reason for this is that the relative price of labor (i.e., P_L/P_K, or slope of the isocosts) is lower in Nation 1 than in Nation 2.

If, for whatever reason, the relative price of labor (i.e., P_L/P_K) rose in both nations, each nation would substitute K for L in the production of both commodities to minimize costs. As a result, the K/L ratio would rise in both nations in the production of both commodities.

Even though both X and Y are more K intensive in Nation 2 than in Nation 1, X is always the L-intensive commodity in both nations. This important fact is reflected in the isoquants of X and Y intersecting only once (see Figure 3.8), and it will be of great use in the appendix to Chapter 5, which deals with factor-intensity reversal.

A3.3 Derivation of the Edgeworth Box Diagram and Production Frontiers

We will now use the knowledge gained from Figure 3.8 to derive the Edgeworth box diagram and, from it, the production frontier of each nation. This is illustrated in Figure 3.9 for Nation 1 and in Figure 3.10 for Nation 2.

Our discussion will first concentrate on the top panel of Figure 3.9. The dimensions of the box in the top panel reflect the total amount of L (measured by the length of the box) and K (the height of the box) available in Nation 1 at a given time.

The lower left-hand corner of the box (O_X) represents the zero origin for commodity X, and X-isoquants farther from O_X refer to greater outputs of X. On the other hand, the top right-hand corner (O_Y) represents the zero origin for commodity Y, and Y-isoquants farther from O_Y refer to greater outputs of Y.

Any point within the box indicates how much of the *total* amount of labor available (L) and how much of the total amount of capital available (K) are used in the production of X and Y. For example, at point A, L_A and K_A are used to produce 50X, and the remaining quantities, or $L - L_A$ and $K - K_A$, are used in the production of 60Y (see Figure 3.9).

By joining all points in the box where an X-isoquant is tangent to a Y-isoquant, we get the nation's production contract curve. Thus, the contract curve of Nation 1 is given by the line joining O_X to O_Y through points A, F, and B. At any point not on the contract curve, production is not efficient because the nation could increase its output of one commodity without reducing its output of the other.

For example, from point Z in the figure, Nation 1 could move to point F and produce more of X (i.e., 95X instead of 50X) and the same amount of Y (both Z and F are on the isoquant for 45Y). Or Nation 1 could move from point Z to point A and produce more of Y (i.e., 60Y instead of 45Y) and the same amount of X (both Z and A are on the isoquant for 50X). Or Nation 1 could produce a little more of both X and Y and end up on the contract curve somewhere between A and F. (The isoquants for this are not shown in the figure.) Once on its contract curve, Nation 1 could only expand the output of one commodity by reducing the output of the other. The fact that the contract curve bulges toward the lower right-hand corner indicates that commodity X is the L-intensive commodity in Nation 1.

By transposing the contract curve from the input space in the top panel to the output space in the bottom panel, we derive Nation 1's production frontier, shown in the bottom panel. For example, from point Z, where the isoquant for 50X crosses the straight-line

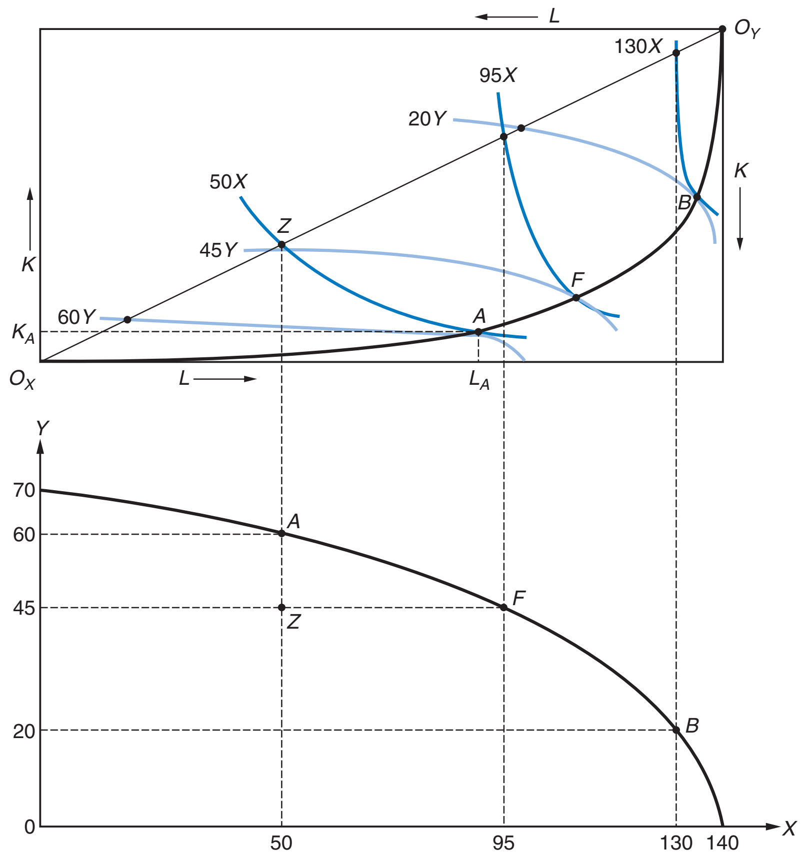

FIGURE 3.9. Derivation of the Edgeworth Box Diagram and Production Frontier for Nation 1. The size of the box in the top panel gives the total amount of *L* and *K* available to Nation 1. The bottom left-hand corner is the origin for X, so that higher X outputs are given by X-isoquants farther away from this origin. The top right-hand corner is the origin for Y, and higher Y outputs are given by Y-isoquants farther from this origin. Any point in the box gives how much *K* and *L* are used in the production of X and Y, respectively. The line joining points of tangency of X- and Y-isoquants is called the *contract curve*. Any point not on the contract curve is not efficient because the nation could produce more of one commodity without reducing the output of the other. The contract curve is not a straight line because factor prices change to keep *K* and *L* fully employed. By mapping the contract curve from input to output space, we derive the production frontier of Nation 1 in the bottom panel.

diagonal $O_X O_Y$ in the top panel, we get point *A* (i.e., 50X) in the bottom panel. Note that point *A* in the bottom panel is directly below point *Z* in the top panel, rather than directly below point *A* in the top panel, because output is *measured* at constant K/L (i.e., along the straight-line diagonal). The measurement along the diagonal reflects the fact that inputs are being used to measure outputs (with constant returns to scale).

Even though outputs are measured along the diagonal, efficiency considerations (discussed earlier) require that Nation 1 produce 50X at point *A* in the top panel, where the X-isoquant for 50X is *tangent* to the Y-isoquant for 60Y. This gives point *A* in the bottom panel, referring to the output of 50X and 60Y. If Nation 1 produced at point *Z* instead of

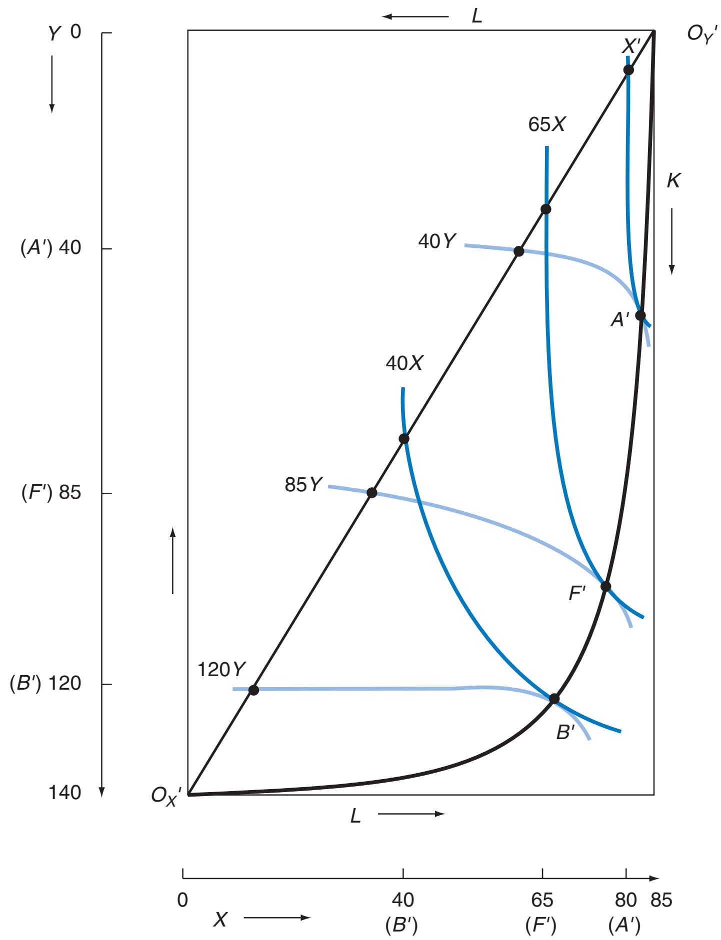

FIGURE 3.10. Derivation of the Edgeworth Box Diagram and Production Frontier for Nation 2. The dimensions of its Edgeworth box indicate that Nation 2 has a relative abundance of *K* compared with Nation 1. Efficiency considerations require that Nation 2 produce on its contract curve shown by the line joining $0_X'$ to $0_Y'$ through points *A*′, *F*′, and *B*′. The amount of commodity X produced at points *A*′, *F*′, and *B*′ is given by the points where the X-isoquant through each crosses the diagonal. This output is then projected down to the X-axis at the bottom of the figure. Similarly, the amount of commodity Y produced at points *A*′, *F*′, and *B*′ is given by the points where the Y-isoquant through each (and tangent to an X-isoquant) crosses the diagonal. This output is then projected to the Y-axis at the left of the figure.

point *A* in the top panel, Nation 1 would produce 50X but only 45Y, giving point *Z* *inside* the production frontier in the bottom panel.

Similarly, directly below the point in the top panel where the X-isoquant showing 95X crosses the diagonal, we get point *F*, referring to 95X and 45Y, on the production frontier in the bottom panel. Finally, point *B* on the isoquants for 130X and 20Y in the top panel is projected down to point *B*, referring to 130X and 20Y, on the production frontier in the bottom panel. Thus, there is a one-to-one correspondence between the contract curve and the production frontier, with each point on the contract curve uniquely defining one point on the production frontier.

Note that the output of commodity X is proportional to the distance from origin O_X along the diagonal because of our assumption of constant returns to scale. Similarly, the output of commodity Y is proportional to the distance from origin O_Y along the diagonal. (This is the reason for measuring outputs along the diagonal.) Also note that the X-intercept and the Y-intercept of the production frontier correspond to the length and height of the Edgeworth box.

Figure 3.10 shows the Edgeworth box for Nation 2. The dimensions of the box indicate that Nation 2 has a relative abundance of K compared with Nation 1. As with Nation 1, the amount of commodity X produced at points A', F', and B' is given by the points where the X-isoquant through each point crosses the diagonal. This output is then projected down to the X-axis at the bottom of the figure. Similarly, the amount of commodity Y produced at points A', F', and B' is given by the points where the Y-isoquant through each point (and tangent to an X-isoquant) crosses the diagonal. This output is then projected to the Y-axis at the left of the figure. For example, the X-isoquant through B' crosses the diagonal at an output of 40X (see the X-axis at the bottom of the figure). Similarly, the Y-isoquant through point B' crosses the diagonal at the output of 120Y (see the Y-axis at the left of the figure). These give the coordinates of point B' as 40X and 120Y on Nation 2's production frontier (not shown). The other points on Nation 2's production frontier are similarly derived. Note that the production frontiers for Nation 1 and Nation 2 that we have just derived are the ones that we used earlier in this chapter. However, we have now derived rather than assumed them.

Problem Derive from Figure 3.10 Nation 2's production frontier. Which commodity is L intensive in Nation 2? Why?

A3.4 Some Important Conclusions

The movement from point A to point B on Nation 1's *contract curve* (see Figure 3.9) refers to an increase in the production of X (the commodity of its comparative advantage) and results in a rise in the K/L ratio. This rise in the K/L ratio is measured by the increase in the slope of a straight line (not drawn) from origin O_X to point B as opposed to point A. The same movement from point A to point B also raises the K/L ratio in the production of Y. This is measured by the increase in the slope of a line from origin O_Y to point B as opposed to point A.

The rise in the K/L ratio in the production of both commodities in Nation 1 can be explained as follows. Since Y is K intensive, as Nation 1 reduces its output of Y, capital and labor are released in a ratio that exceeds the K/L ratio used in expanding the production of X. There would then be a tendency for some of the nation's capital to be unemployed, causing the relative price of K to fall (i.e., P_L/P_K to rise).

As a result, Nation 1 will substitute K for L in the production of both commodities until all available K is once again fully utilized. Thus, the K/L ratio in Nation 1 rises in the production of both commodities. This also explains why the production contract curve is not a straight line but becomes steeper as Nation 1 produces more X (i.e., it moves farther from origin O_X). The *contract curve would be a straight line only if relative factor prices remained unchanged, and here factor prices change*. The rise in P_L/P_K in Nation 1 can be visualized in the top panel of Figure 3.9 by the greater slope of the common tangent to the isoquants at point B as opposed to point A (to keep the figure simple, such tangents are not actually drawn). We will review and expand these results in the appendix to Chapter 5, where we prove the factor-price equalization theorem of the Heckscher–Ohlin trade model.

Problem Explain why, as Nation 2 moves from point A' to point B' on its contract curve (i.e., specializes in the production of Y, the commodity of its comparative advantage), its K/L ratio *falls* in the production of both X and Y. (If you cannot, reread Section A3.4.)

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INTERNet

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http://www.wto.org

http://unstats.un.org/unsd

http://www.imf.org

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http://www.bls.gov/data/home.htm

For skepticism of free trade, see:

http://www.citizen.org/trade

chapter 4

Demand and Supply, Offer Curves, and the Terms of Trade

LEARNING GOALS:

After reading this chapter, you should be able to:

- Show how the equilibrium price at which trade takes place is determined by demand and supply
- Show how the equilibrium price at which trade takes place is determined with offer curves
- Explain the meaning of the terms of trade and how they changed over time for the United States and other countries

4.1 Introduction

We saw in Chapter 3 that a difference in relative commodity prices between two nations in isolation is a reflection of their comparative advantage and forms the basis for mutually beneficial trade. The equilibrium-relative commodity price at which trade takes place was then found by trial and error at the level at which trade was balanced. In this chapter, we present a more rigorous theoretical way of determining the equilibrium-relative commodity price with trade. We will first do this with partial equilibrium analysis (i.e., by utilizing demand and supply curves) and then by the more complex general equilibrium analysis, which makes use of offer curves.

Section 4.2 shows how the equilibrium-relative commodity price with trade is determined with demand and supply curves (i.e., with partial equilibrium analysis). We then go on to general equilibrium analysis and derive the offer curves of Nation 1 and Nation 2 in Section 4.3. In Section 4.4, we examine how the interaction of the offer curves of the two nations defines the equilibrium-relative commodity price with trade. In Section 4.5, we look at the relationship between general and partial equilibrium analyses. Finally, Section 4.6 examines the meaning, measurement, and importance of the terms of trade. The appendix to this chapter presents the *formal* derivation of offer curves and examines the case of multiple and unstable equilibria.

4.2 The Equilibrium-Relative Commodity Price with Trade—Partial Equilibrium Analysis

Figure 4.1 shows how the equilibrium-relative commodity price with trade is determined by partial equilibrium analysis. Curves D_X and S_X in panels A and C of Figure 4.1 refer to the demand and supply curves for commodity X of Nation 1 and Nation 2, respectively. The vertical axes in all three panels of Figure 4.1 measure the relative price of commodity X (i.e., P_X/P_Y, or the amount of commodity Y that a nation must give up to produce one additional unit of X). The horizontal axes measure the quantities of commodity X.

Panel A of Figure 4.1 shows that in the absence of trade, Nation 1 produces and consumes at point A at the relative price of X of P_1, while Nation 2 produces and consumes at point A' at P_3. With the opening of trade, the relative price of X will be between P_1 and P_3 if both nations are large. At prices above P_1, Nation 1 will supply (produce) more than it will demand (consume) of commodity X and will export the difference or excess supply (see panel A). Alternatively, at prices below P_3, Nation 2 will demand a greater quantity of commodity X than it produces or supplies domestically and will import the difference or excess demand (see panel C).

Specifically, panel A shows that at P_1, the quantity supplied of commodity X (QS_X) equals the quantity demanded of commodity X (QD_X) in Nation 1, and so Nation 1 *exports* nothing of commodity X. This gives point A^* on curve S (Nation 1's supply curve of exports) in panel B. Panel A also shows that at P_2, the excess of BE of QS_X over QD_X represents the quantity of commodity X that Nation 1 would export at P_2. This is equal to B^*E^* in panel B and defines point E^* on Nation 1's S curve of exports of commodity X.

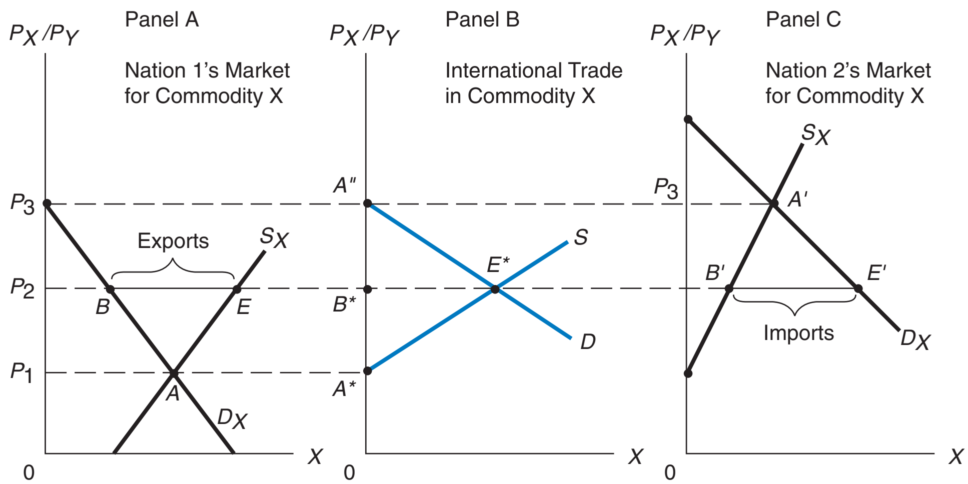

FIGURE 4.1. The Equilibrium-Relative Commodity Price with Trade with Partial Equilibrium Analysis. At P_X/P_Y larger than P_1, Nation 1's excess supply of commodity X in panel A gives rise to Nation 1's supply curve of exports of commodity X (S) in panel B. On the other hand, at P_X/P_Y lower than P_3, Nation 2's excess demand for commodity X in panel C gives rise to Nation 2's demand for imports of commodity X (D) in panel B. Panel B shows that only at P_2 does the quantity of imports of commodity X demanded by Nation 2 equal the quantity of exports supplied by Nation 1. Thus, P_2 is the equilibrium P_X/P_Y with trade. At $P_X/P_Y > P_2$, there will be an excess supply of exports of commodity X, and this will drive P_X/P_Y down to P_2. At $P_X/P_Y < P_2$, there will be an excess demand for imports of X, and this will drive P_X/P_Y up to P_2.

On the other hand, panel C shows that at P_3, $QD_X = QS_X$ (point A'), so Nation 2 does not demand any *imports* of commodity X. This defines point A'' on Nation 2's demand curve for imports of commodity X (D) in panel B. Panel C also shows that at P_2, the excess $B'E'$ of QD_X over QS_X represents the quantity of commodity X that Nation 2 would import at P_2. This is equal to B^*E^* in panel B and defines point E^* on Nation 2's D curve of imports of commodity X.

At P_2, the quantity of imports of commodity X demanded by Nation 2 ($B'E'$ in panel C) equals the quantity of exports of commodity X supplied by Nation 1 (BE in panel A). This is shown by the intersection of the D and S curves for trade in commodity X in panel B. Thus, P_2 is the equilibrium-relative price of commodity X with trade. From panel B we can also see that at $P_X/P_Y > P_2$ the quantity of exports of commodity X supplied exceeds the quantity of imports demanded, and so the relative price of X (P_X/P_Y) will fall to P_2. On the contrary, at $P_X/P_Y < P_2$, the quantity of imports of commodity X demanded exceeds the quantity of exports supplied, and P_X/P_Y will rise to P_2.

The same could be shown with commodity Y. Commodity Y is exported by Nation 2 and imported by Nation 1. At any relative price of Y higher than equilibrium, the quantity of

CASE STUDY 4-1 Demand, Supply, and the International Price of Petroleum

Table 4.1 shows that the price of petroleum fluctuated widely from 1972 to 2011. As a result of supply shocks during the Arab-Israeli War in fall 1973 and the Iranian revolution in 1979–1980, OPEC (Organization of Petroleum Exporting Countries) was able to increase the price of petroleum from an average of \$2.89 per barrel in 1972 to \$11.60 in 1974 and to \$36.68 per barrel in 1980. These increases stimulated energy conservation and expanded exploration and petroleum production by non-OPEC countries. In the face of excess supplies during the 1980s and 1990s, OPEC was unable to prevent the price of petroleum from falling to a low of \$14.17 in 1986 and \$13.07 in 1998. The price of petroleum then rose to \$28.23 in 2000 and \$104.00 in 2011 (the all-time monthly high was \$132.60 in July 2008).

If we consider, however, that all prices have risen over time, we can see from Table 4.1 that the real (i.e., inflation-adjusted) price of petroleum rose from \$2.89 per barrel in 1972 to \$9.51 in 1974 and to \$17.14 in 1980; it then fell to \$4.69 in 1986 and \$2.90 in 1998, but it subsequently rose to \$5.73 in 2000 and \$14.83 in 2008, and it was \$15.80 in 2011. Thus, the real price of petroleum was 5.47 times higher (15.80/2.89) in 2011 than in 1972, rather than by 35.99 times in nominal prices.

TABLE 4.1. Nominal and Real Petroleum Prices, Selected Years, 1972–2011

Year	1972	1973	1974	1978	1979	1980	1985
Petroleum Prices (\$/barrel)	2.89	3.24	11.60	13.39	30.21	36.68	27.37
Real Petroleum Prices (\$/barrel)	2.89	3.00	9.51	7.70	15.82	17.14	9.34
Year	**1986**	**1990**	**1998**	**2000**	**2005**	**2008**	**2011**
Petroleum Prices (\$/barrel)	14.17	22.99	13.07	28.23	53.40	97.03	140.00
Real Petroleum Prices (\$/barrel)	4.69	6.51	2.90	5.73	8.99	14.83	15.80

Source: Elaborated from data in International Monetary Fund, *International Financial Statistics* (Washington, D.C.: IMF, various issues).

exports of Y supplied by Nation 2 would exceed the quantity of imports of Y demanded by Nation 1, and the relative price of Y would fall to the equilibrium level. On the other hand, at any P_Y/P_X below equilibrium, the quantity of imports of Y demanded would exceed the quantity of exports of Y supplied, and P_Y/P_X would rise to the equilibrium level. (You will be asked to show this graphically in Problem 1.) Case Study 4-1 shows the international price of petroleum in nominal and real (i.e., inflation-adjusted) terms from 1972 to 2010, while Case Study 4-2 shows the index of export to import prices for the United States over the same period.

CASE STUDY 4-2 The Index of Export to Import Prices for the United States

Figure 4.2 shows the index of U.S. export to import prices or terms of trade from 1972 to 2011. This index declined almost continuously from 1972 to 1980, it rose from 1980 to 1986, and then it remained in the 96–107 range (with 2000 = 100), except in 2008, when it fell to 92. The decline in the index was particularly large during the two "oil shocks" of 1973–74 and 1979–80, and from 2002 to 2008 when the price of petroleum and other primary commodities imports rose sharply. From the figure, we see that the average *relative* price of U.S. exports declined from 127.1 in 1972 to 90.2 in 1980, and 91.8 in 2008, and it was 94.6 in 2011. This means that, on the average, the United States had to export 34 percent more of its goods and services in 1980, 32 percent more in 2008, and 29 percent more in 2011 to import the same quantity of goods and services that it did in 1972.

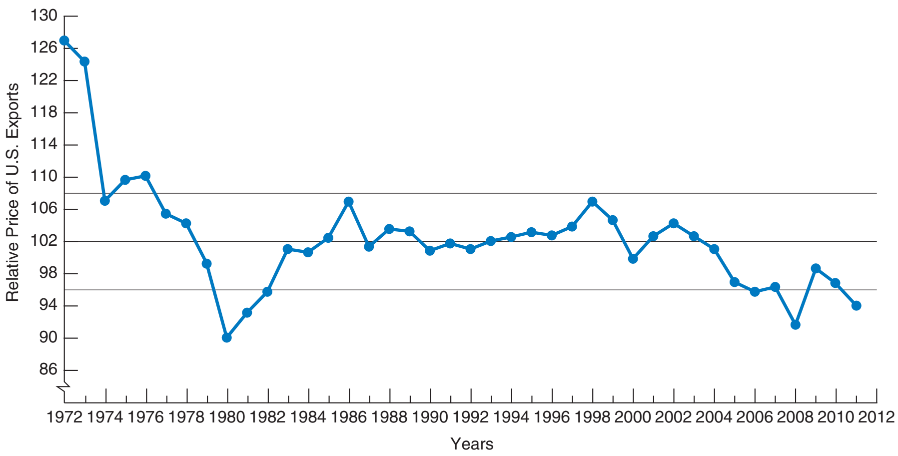

FIGURE 4.2. Index of Relative U.S. Export Prices, 1972–2011 (2000 = 100).
The index of U.S. export to import prices declined from 127.1 in 1972 to 107.2 in 1974 (due to the sharp increase in petroleum prices in 1973 and 1974) and to 90.2 in 1980, as a result of the second "oil shock." The index then rose to 107.1 in 1986, but it fell to 91.8 in 2008 as a result of the sharp increase in the price of petroleum and other primary commodities imports. The index was 94.6 in 2011.
Source: Elaborated from data in International Monetary Fund, *International Financial Statistics* Washington, D.C.: IMF, various issues.

4.3 Offer Curves

In this section, we define offer curves and note their origin. We then derive the offer curves of the two nations and examine the reasons for their shape.

4.3A Origin and Definition of Offer Curves

Offer curves (sometimes referred to as **reciprocal demand curves**) were devised and introduced into international economics by *Alfred Marshall* and *Ysidro Edgeworth*, two British economists, at the turn of the twentieth century. Since then, offer curves have been used extensively in international economics, especially for pedagogical purposes.

The offer curve of a nation shows how much of its import commodity the nation demands for it to be willing to supply various amounts of its export commodity. As the definition indicates, offer curves incorporate elements of both demand and supply. Alternatively, we can say that the offer curve of a nation shows the nation's willingness to import and export at various relative commodity prices.

The offer curve of a nation can be derived rather easily and somewhat informally from the nation's production frontier, its indifference map, and the various hypothetical relative commodity prices at which trade could take place. The formal derivation of offer curves presented in the appendix is based on the work of *James Meade*, another British economist and Nobel Prize winner.

4.3B Derivation and Shape of the Offer Curve of Nation 1

In the left panel of Figure 4.3, Nation 1 starts at the no-trade (or autarky) point *A*, as in Figure 3.3. If trade takes place at $P_B = P_X/P_Y = 1$, Nation 1 moves to point *B* in production, trades 60X for 60Y with Nation 2, and reaches point *E* on its indifference curve III. (So far this is exactly the same as in Figure 3.4.) This gives point *E* in the right panel of Figure 4.3.

At $P_F = P_X/P_Y = ½$ (see the left panel of Figure 4.3), Nation 1 would move instead from point *A* to point *F* in production, exchange 40X for 20Y with Nation 2, and reach point *H* on its indifference curve II. This gives point *H* in the right panel. Joining the origin with points *H* and *E* and other points similarly obtained, we generate Nation 1's offer curve in the right panel. The offer curve of Nation 1 shows how many imports of commodity Y Nation 1 requires to be willing to export various quantities of commodity X.

To keep the left panel simple, we omitted the autarky price line $P_A = ¼$ and indifference curve I tangent to the production frontier and P_A at point *A*. Note that P_A, P_F, and P_B in the right panel refer to the same P_X/P_Y as P_A, P_F, and P_B in the left panel because they refer to the same *absolute* slope.

The offer curve of Nation 1 in the right panel of Figure 4.3 lies above the autarky price line of $P_A = ¼$ and bulges toward the X-axis, which measures the commodity of its comparative advantage and export. To induce Nation 1 to export more of commodity X, P_X/P_Y must rise. Thus, at $P_F = ½$, Nation 1 would export 40X, and at $P_B = 1$, it would export 60X. There are two reasons for this: (1) Nation 1 incurs increasing opportunity costs in producing more of commodity X (for export), and (2) the more of commodity Y and the less of commodity X that Nation 1 consumes with trade, the more valuable to the nation is a unit of X at the margin compared with a unit of Y.

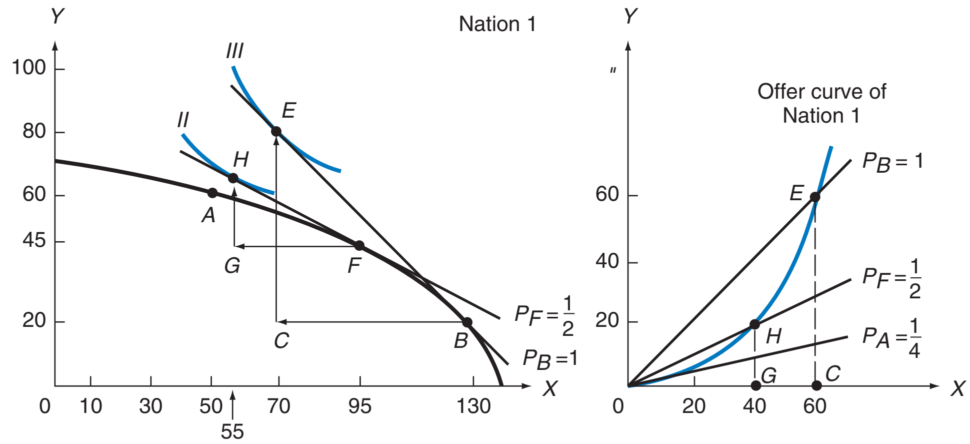

FIGURE 4.3. Derivation of the Offer Curve of Nation 1.
In the left panel, Nation 1 starts at pretrade-equilibrium point A. If trade takes place at $P_B = 1$, Nation 1 moves to point B in production, exchanges 60X for 60Y with Nation 2, and reaches point E. This gives point E in the right panel. At $P_F = \frac{1}{2}$ in the left panel, Nation 1 would move instead from point A to point F in production, exchange 40X for 20Y with Nation 2, and reach point H. This gives point H in the right panel. Joining the origin with points H and E in the right panel, we generate Nation 1's offer curve. This shows how many imports of commodity Y Nation 1 requires to be willing to export various quantities of commodity X.

4.3c Derivation and Shape of the Offer Curve of Nation 2

In the left panel of Figure 4.4, Nation 2 starts at the autarky equilibrium point A', as in Figure 3.3. If trade takes place at $P_{B'} = P_X/P_Y = 1$, Nation 2 moves to point B' in production, exchanges 60Y for 60X with Nation 1, and reaches point E' on its indifference curve III$'$. (So far this is exactly the same as in Figure 3.4.) Trade triangle $B'C'E'$ in the left panel of Figure 4.4 corresponds to trade triangle $O'C'E'$ in the right panel, and we get point E' on Nation 2's offer curve.

At $P_{F'} = P_X/P_Y = 2$ in the left panel, Nation 2 would move instead to point F' in production, exchange 40Y for 20X with Nation 1, and reach point H' on its indifference curve II$'$. Trade triangle $F'G'H'$ in the left panel corresponds to trade triangle $O'G'H'$ in the right panel, and we get point H' on Nation 2's offer curve. Joining the origin with points H' and E' and other points similarly obtained, we generate Nation 2's offer curve in the right panel. The offer curve of Nation 2 shows how many imports of commodity X Nation 2 demands to be willing to export various quantities of commodity Y.

Once again, we omitted the autarky price line $P_{A'} = 4$ and indifference curve I$'$ tangent to the production frontier and $P_{A'}$ at point A'. Note that $P_{A'}$, $P_{F'}$, and $P_{B'}$ in the right panel refer to the same P_X/P_Y as $P_{A'}$, $P_{F'}$, and $P_{B'}$ in the left panel because they refer to the same *absolute* slope.

The offer curve of Nation 2 in the right panel of Figure 4.4 lies *below* its autarky price line of $P_{A'} = 4$ and bulges toward the Y-axis, which measures the commodity of its comparative advantage and export. To induce Nation 2 to export more of commodity Y, the

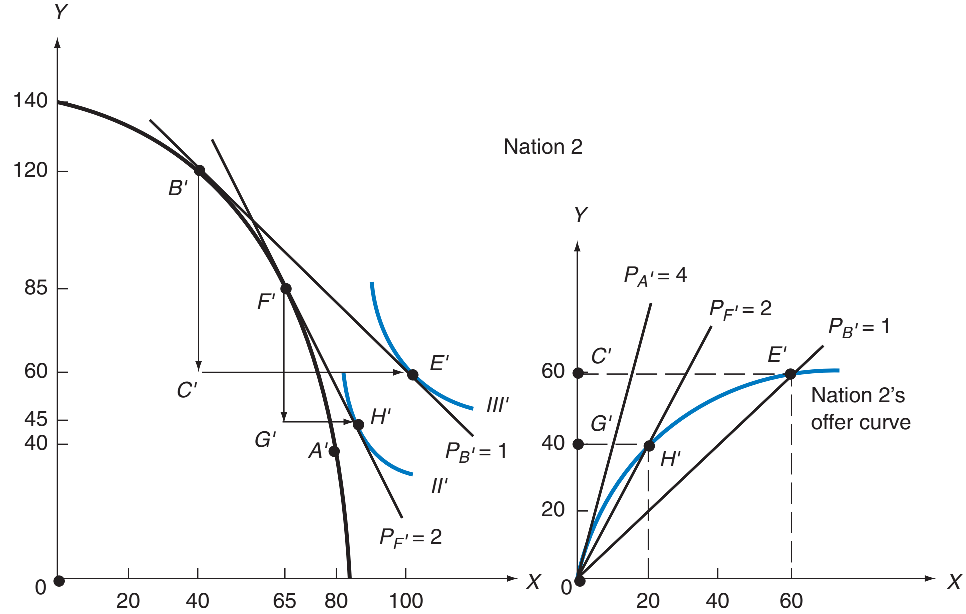

FIGURE 4.4. Derivation of the Offer Curve of Nation 2.
In the left panel, Nation 2 starts at pretrade equilibrium point A'. If trade takes place at $P_{B'} = 1$, Nation 2 moves to point B' in production, exchanges 60Y for 60X with Nation 1, and reaches point E'. This gives point E' in the right panel. At $P_{F'} = 2$ in the left panel, Nation 2 would move instead from A' to F' in production, exchange 40Y for 20X with Nation 1, and reach H'. This gives point H' in the right panel. Joining the origin with points H' and E' in the right panel, we generate Nation 2's offer curve. This shows how many imports of commodity X Nation 2 demands to be willing to supply various amounts of commodity Y for export.

relative price of Y must rise. This means that its reciprocal (i.e., P_X/P_Y) must fall. Thus, at $P_{F'} = 2$, Nation 2 would export 40Y, and at $P_{B'} = 1$, it would export 60Y. Nation 2 requires a higher relative price of Y to be induced to export more of Y because (1) Nation 2 incurs increasing opportunity costs in producing more of commodity Y (for export), and (2) the more of commodity X and the less of commodity Y that Nation 2 consumes with trade, the more valuable to the nation is a unit of Y at the margin compared with a unit of X.

4.4 The Equilibrium-Relative Commodity Price with Trade—General Equilibrium Analysis

The intersection of the offer curves of the two nations defines the equilibrium-relative commodity price at which trade takes place between them. Only at this equilibrium price will trade be balanced between the two nations. At any other relative commodity price, the *desired* quantities of imports and exports of the two commodities would not be equal. This would put pressure on the relative commodity price to move toward its equilibrium level. This is shown in Figure 4.5.

The offer curves of Nation 1 and Nation 2 in Figure 4.5 are those derived in Figures 4.3 and 4.4. These two offer curves intersect at point E, defining equilibrium $P_X/P_Y = P_B = P_{B'} = 1$. At P_B, Nation 1 offers 60X for 60Y (point E on Nation 1's offer curve), and Nation 2 offers exactly 60Y for 60X (point E' on Nation 2's offer curve). Thus, trade is in equilibrium at P_B.

At any other P_X/P_Y, trade would not be in equilibrium. For example, at $P_F = \frac{1}{2}$, the 40X that Nation 1 would export (see point H in Figure 4.5) would fall short of the imports of commodity X demanded by Nation 2 at this relatively low price of X. (This is given by a point, not shown in Figure 4.5, where the extended price line P_F crosses the extended offer curve of Nation 2.)

The excess import demand for commodity X at $P_F = \frac{1}{2}$ by Nation 2 tends to drive P_X/P_Y up. As this occurs, Nation 1 will supply more of commodity X for export (i.e., Nation 1 will move up its offer curve), while Nation 2 will reduce its import demand for commodity X (i.e., Nation 2 will move down its offer curve). This will continue until supply and demand become equal at P_B. The pressure for P_F to move toward P_B could also be explained in terms of commodity Y and arises at any other P_X/P_Y, such as $P_F \neq P_B$.

Note that the equilibrium-relative commodity price of $P_B = 1$ with trade (determined in Figure 4.5 by the intersection of the offer curves of Nation 1 and Nation 2) is identical to that found by trial and error in Figure 3.4. At $P_B = 1$, both nations happen to gain equally from trade (refer to Figure 3.4).

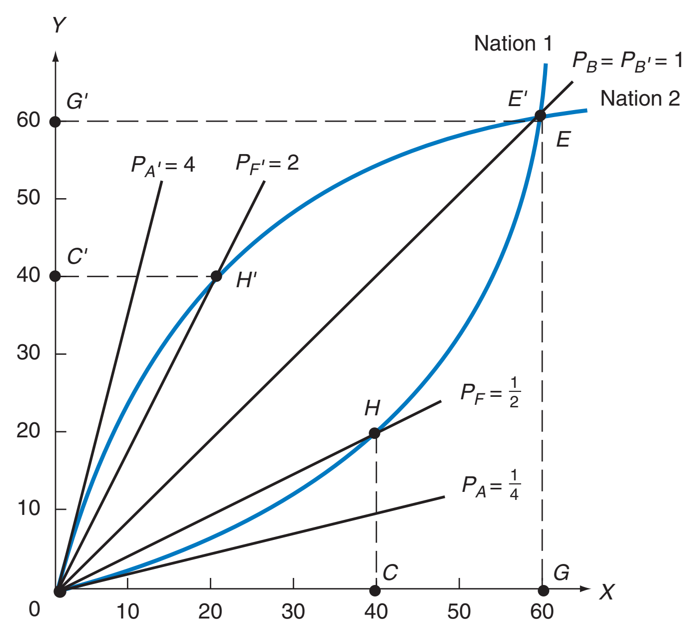

FIGURE 4.5. Equilibrium-Relative Commodity Price with Trade.
The offer curves of Nation 1 and Nation 2 are those of Figures 4.3 and 4.4. The offer curves intersect at point E, defining the equilibrium-relative commodity price $P_B = 1$. At P_B, trade is in equilibrium because Nation 1 offers to exchange 60X for 60Y and Nation 2 offers exactly 60Y for 60X. At any $P_X/P_Y < 1$, the quantity of exports of commodity X supplied by Nation 1 would fall short of the quantity of imports of commodity X demanded by Nation 2. This would drive the relative commodity price up to the equilibrium level. The opposite would be true at $P_X/P_Y > 1$.

4.5 Relationship between General and Partial Equilibrium Analyses

We can also illustrate equilibrium for our two nations with demand and supply curves and thus show the relationship between the general equilibrium analysis of Section 4.4 and the partial equilibrium analysis of Section 4.2. This is shown with Figure 4.6.

In Figure 4.6, *S* is Nation 1's supply curve of exports of commodity X and is derived from Nation 1's production frontier and indifference map in the left panel of Figure 4.3 (the same information from which Nation 1's offer curve in the right panel of Figure 4.3 is derived). Specifically, *S* shows that the quantity supplied of exports of commodity X by Nation 1 is zero (point *A*) at $P_X/P_Y = 1/4$, 40 (point *H*) at $P_X/P_Y = 1/2$, and 60 (point *E*) at $P_X/P_Y = 1$ *(as indicated in the left panel of Figure 4.3 and on Nation 1's offer curve in the right panel of Figure 4.3)*. The export of 70X by Nation 1 at $P_X/P_Y = 1\frac{1}{2}$ (point *R* on the *S* curve in Figure 4.6) can similarly be obtained from the left panel of Figure 4.3 and is shown as point *R* on Nation 1's offer curve in Figure 4.9 in Appendix A4.3.

On the other hand, *D* refers to Nation 2's demand for Nation 1's exports of commodity X and is derived from Nation 2's production frontier and indifference map in the left panel of Figure 4.4 (the same information from which Nation 2's offer curve in the right panel of Figure 4.4 is derived). Specifically, *D* in Figure 4.6 shows that the quantity demanded of Nation 1's exports of commodity X by Nation 2 is 60 (point *E*) at $P_X/P_Y = 1$ (as in the left panel of Figure 4.4), 120 (point *H′*) at $P_X/P_Y = 1/2$, but 40 (point *R′*) at $P_X/P_Y = 1\frac{1}{2}$.

D and *S* intersect at point *E* in Figure 4.6, determining the equilibrium $P_X/P_Y = 1$ and the equilibrium quantity of exports of 60X (as in Figure 4.5). Figure 4.6 shows that at

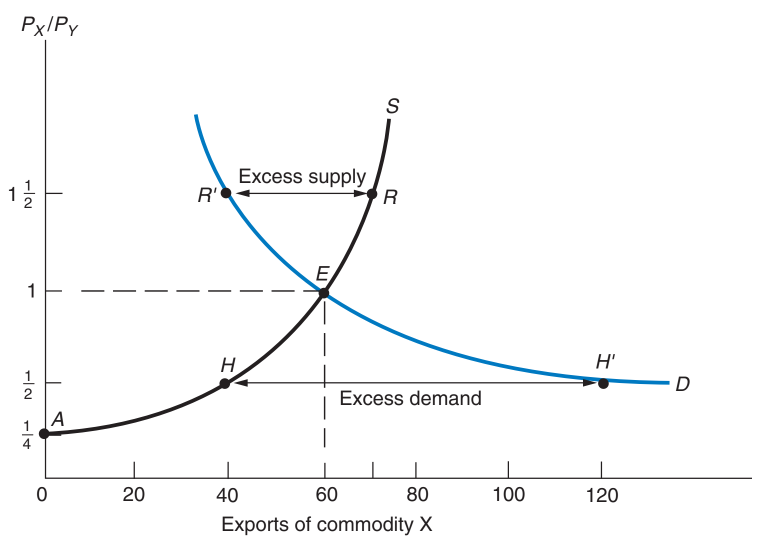

FIGURE 4.6. Equilibrium-Relative Commodity Price with Partial Equilibrium Analysis. *S* refers to Nation 1's supply curve of exports of commodity X, while *D* refers to Nation 2's demand curve for Nation 1's exports of commodity X. *S* and *D* are derived from the left panel of Figures 4.3 and 4.4, and show the same basic information as Figure 4.5. *D* and *S* intersect at point *E*, determining the equilibrium $P_X/P_Y = 1$ and the equilibrium quantity of exports of 60X. At $P_X/P_Y = 1\frac{1}{2}$, there is an excess supply of exports of $R'R = 30X$, and P_X/P_Y falls toward equilibrium $P_X/P_Y = 1$. At $P_X/P_Y = 1/2$, there is an excess demand of exports of $HH' = 80X$, and P_X/P_Y rises toward $P_X/P_Y = 1$.

$P_X/P_Y = 1\frac{1}{2}$ there is an excess supply of exports of $R'R = 30\text{X}$, and P_X/P_Y falls toward equilibrium $P_X/P_Y = 1$. On the other hand, at $P_X/P_Y = \frac{1}{2}$, there is an excess demand of exports of $HH' = 80\text{X}$, and P_X/P_Y rises toward $P_X/P_Y = 1$. Thus, the relative price of X gravitates toward the equilibrium price of $P_X/P_Y = 1$, given by point E in Figure 4.6 (the same as in Figure 4.5). The same conclusion would be reached in terms of Y (see Problem 8, with answer at www.wiley.com/college/salvatore).

If, on the other hand, Nation 2 were small, its demand curve for Nation 1's exports of commodity X would intersect the horizontal portion of Nation 1's supply curve of exports of commodity X (near the vertical axis). In that case, Nation 2 would trade at the pretrade price of $P_X/P_Y = \frac{1}{4}$ in Nation 1, and Nation 2 would receive all of the gains from trade. (This could also be shown with offer curves; see Problem 10, with the answer on the Web.)

Going back to our Figure 4.6, we see that it shows the same basic information as Figure 4.5, and both are derived from the nations' production frontiers and indifference maps. There is a basic difference, however, between the two figures. Figure 4.5 refers to general equilibrium analysis and considers all markets together, not just the market for commodity X. This is important because changes in the market for commodity X affect other markets, and these may give rise to important repercussions on the market for commodity X itself. On the other hand, the partial equilibrium analysis of Figure 4.6, which utilizes D and S curves, does not consider these repercussions and the connections that exist between the market for commodity X and the market for all other commodities in the economy. Partial equilibrium analysis is often useful as a first approximation, but for the complete and full answer, the more difficult general equilibrium analysis is usually required.

4.6 The Terms of Trade

In this section, we define the terms of trade of each nation and illustrate their measurement. We also discuss the meaning of a change in a nation's terms of trade. Finally, we pause to take stock of what we have accomplished up to this point and examine the usefulness of our trade model.

4.6A Definition and Measurement of the Terms of Trade

The **terms of trade** of a nation are defined as the ratio of the price of its export commodity to the price of its import commodity. Since in a two-nation world, the exports of a nation are the imports of its trade partner, the terms of trade of the latter are equal to the inverse, or reciprocal, of the terms of trade of the former.

In a world of many (rather than just two) traded commodities, the terms of trade of a nation are given by the ratio of the price *index* of its exports to the price *index* of its imports. This ratio is usually multiplied by 100 in order to express the terms of trade in percentages. These terms of trade are often referred to as the **commodity or net barter terms of trade** to distinguish them from other measures of the terms of trade presented in Chapter 11 in connection with trade and development.

As supply and demand considerations change over time, offer curves will shift, changing the volume and the terms of trade. This matter will be examined in Chapter 7, which deals with growth and change, and international trade. An improvement in a nation's terms of trade is usually regarded as beneficial to the nation in the sense that the prices that the nation receives for its exports rise relative to the prices that it pays for imports.

4.6B Illustration of the Terms of Trade

Since Nation 1 exports commodity X and imports commodity Y, the terms of trade of Nation 1 are given by P_X/P_Y. From Figure 4.5, these are $P_X/P_Y = P_B = 1$ or 100 (in percentages). If Nation 1 exported and imported many commodities, P_X would be the *index* of its export prices, and P_Y would be the *index* of its import prices.

Since Nation 2 exports commodity Y and imports commodity X, the terms of trade of Nation 2 are given by P_Y/P_X. Note that this is the inverse, or reciprocal, of Nation 1's terms of trade and also equals 1 or 100 (in percentages) in this case.

If through time the terms of trade of Nation 1 rose, say, from 100 to 120, this would mean that Nation 1's export prices rose 20 percent in relation to its import prices. This would also mean that Nation 2's terms of trade have deteriorated from 100 to (100/120)100 = 83. Note that we can always set a nation's terms of trade equal to 100 in the base period, so that changes in its terms of trade over time can be measured in percentages.

Even if Nation 1's terms of trade improve over time, we cannot conclude that Nation 1 is *necessarily* better off because of this, or that Nation 2 is necessarily worse off because of the deterioration in its terms of trade. Changes in a nation's terms of trade are the result of many forces at work both in that nation and in the rest of the world, and we cannot determine their net effect on a nation's welfare by simply looking at the change in the nation's terms of trade. To answer this question, we need more information and analysis, and we will postpone that until Chapter 11. Case Study 4-3 shows the terms of trade of

CASE STUDY 4-3 The Terms of Trade of the G-7 Countries

Table 4.2 gives the terms of trade of the Group of 7 largest advanced countries (G-7) for selected years from 1972 to 2011. The terms of trade were measured by dividing the index of export unit value by the index of import unit value, taking 2000 as 100. Table 4.2 shows that the terms of trade of the G-7 countries fluctuated very widely over the years and were much lower in 2011 than in 1972 for the United States, Germany, and especially Japan; a little lower for the United Kingdom, France, and Italy; and much higher in the past decade for Canada (primarily because of the sharp increase in the price of petroleum and of other primary commodities, of which Canada is a major exporter).

TABLE 4.2. The Terms of Trade of the G-7 Countries, Selected Years, 1972–2011 (Export Unit Value ÷ Import Unit Value; 2000 = 100)

	1972	1974	1980	1985	1990	1995	2000	2005	2010	2011	% Change 1972–2011
United States	127	107	90	103	101	103	100	97	97	95	−29
Canada	96	109	107	94	97	97	100	117	120	122	24
Japan	109	81	59	66	84	115	100	83	68	60	−58
Germany	118	105	98	94	110	108	100	105	103	99	−18
United Kingdom	107	82	103	102	101	100	100	105	103	103	−4
France	101	89	90	89	100	107	100	111	100*	100*	−1*
Italy	106	80	78	78	94	96	100	101	99	96	−10

*refers to 2008

Source: Elaborated from data in International Monetary Fund, *International Financial Statistics* (Washington, D.C.: IMF, various issues).

CASE STUDY 4-4 The Terms of Trade of Advanced and Developing Countries

Table 4.3 gives the terms of trade of advanced countries and developing countries as a whole, as well as for African, Asian, European, Middle Eastern, and Western Hemispheric developing countries for selected years from 1972 to 2010. The terms of trade were measured by dividing the index of export unit value by the index of import unit value, with 2000 as 100.

Table 4.3 shows that the terms of trade of advanced countries declined from 1972 to 1985 but then rose until 1995, and they were 98 in 2010, as compared with 110 in 1972. For developing countries, the terms of trade rose sharply from 1972 to 1980 primarily as a result of the very sharp increase in the terms of trade of Western Hemispheric countries, but they then declined until 1985 and they were 102 in 2010, as compared with 61 in 1972. The terms of trade of Africa increased from 85 in 1972 to 108 in 2005 (more recent data were not available). From 1972 to 2010, the terms of trade rose for Asia from 101 to 104 and declined for European developing countries from 112 to 95. The term of trade rose sharply for the Western Hemispheric countries from 39 in 1972 to 92 in 2010 and for the Middle East from 94 in 1972 to 167 in 2007 (more recent data were not available).

Although the terms of trade of industrial and developing countries reflected to a large extent the large fluctuations in the price of petroleum over the period examined, other forces were also clearly at work (note, for example, that the largest fluctuation was in the terms of trade of the Western Hemispheric countries, whose exports were mostly nonpetroleum and that the terms of trade of the Middle East as a whole declined between 1972 and 1974 because many Middle Eastern countries did not export petroleum). A detailed analysis and data of the forces that determine the terms of trade of developing countries are presented in Chapter 10.

TABLE 4.3. The Terms of Trade of Advanced and Developing Countries, Selected Years, 1972–2010 (Export Unit Value ÷ Import Unit Value; 2000 = 100)

	1972	1974	1980	1985	1990	1995	2000	2005	2010
Industrial countries	110	97	89	87	100	105	100	101	98
Developing countries	61	86	107	101	103	102	100	99	102
Africa	85	118	117	115	100	103	100	108	—
Asia	101	101	101	98	103	107	100	92	104
Europe	112	101	69	64	69	106	100	102	95
Middle East	94	75	90	80	109	68	100	140	167*
Western Hemisphere	39	110	194	189	130	107	100	104	92

*refers to 2007

Source: International Monetary Fund, *International Financial Statistics* (Washington, D.C.: IMF, various issues).

the G-7 countries, and Case Study 4-4 gives the terms of trade of advanced and developing countries for selected years over the 1972–2010 period.

4.6c Usefulness of the Model

The trade model presented thus far summarizes clearly and concisely a remarkable amount of useful information and analysis. It shows the conditions of production, or supply, in the two nations, the tastes, or demand preferences, the autarky point of production and consumption, the equilibrium-relative commodity price in the absence of trade, and the comparative advantage of each nation (refer to Figure 3.3). It also shows the degree of specialization in production with trade, the volume of trade, the terms of trade, the gains from trade, and the share of these gains going to each of the trading nations (see Figures 3.5 and 4.5).

Because it deals with only two nations (Nation 1 and Nation 2), two commodities (X and Y), and two factors (labor and capital), our trade model is a completely **general equilibrium model**. It can be used to examine how a change in demand and/or supply conditions in a nation would affect the terms of trade, the volume of trade, and the share of the gains from trade in each nation. This is done in Chapter 7.

Before doing that, however, our trade model must be extended in two important directions: (1) to identify the *basis* for (i.e., what determines) comparative advantage and (2) to examine the effect of international trade on the returns, or earnings, of resources or factors of production in the two trading nations. This is done in the next chapter.

SUMMARY

1. In this chapter, we derived the demand for imports and the supply of exports of the traded commodity, as well as the offer curves for the two nations, and used them to determine the equilibrium volume of trade and the equilibrium-relative commodity price at which trade takes place between the two nations. The results obtained here confirm those reached in Chapter 3 by a process of trial and error.

2. The excess supply of a commodity above the no-trade equilibrium price gives one nation's export supply of the commodity. On the other hand, the excess demand of a commodity below the no-trade equilibrium price gives the other nation's import demand for the commodity. The intersection of the demand curve for imports and the supply curve for exports of the commodity defines the partial equilibrium-relative price and quantity of the commodity at which trade takes place.

3. The offer curve of a nation shows how much of its import commodity the nation demands to be willing to supply various amounts of its export commodity. The offer curve of a nation can be derived from its production frontier, its indifference map, and the various relative commodity prices at which trade could take place. The offer curve of each nation bends toward the axis measuring the commodity of its comparative advantage. The offer curves of two nations will lie between their pretrade, or autarky, relative commodity prices. To induce a nation to export more of a commodity, the relative price of the commodity must rise.

4. The intersection of the offer curves of two nations defines the equilibrium-relative commodity price at which trade takes place between them. Only at this equilibrium price will trade be balanced. At any other relative commodity price, the desired quantities of imports and exports of the two commodities would not be equal. This would put pressure on the relative commodity price to move toward its equilibrium level.

5. We can also illustrate the equilibrium-relative commodity price and quantity with trade with partial equilibrium analysis. This makes use of the demand and supply curves for the traded commodities. These are derived from the nations' production frontiers and indifference maps—the same basic information from which the nations' offer curves (which are used in general equilibrium analysis) are derived.

6. The terms of trade of a nation are defined as the ratio of the price of its export commodity to the price of its import commodity. The terms of trade of the trade partner are then equal to the inverse, or reciprocal, of the terms of trade of the other nation. With more than two commodities traded, we use the index of export to import prices and multiply by 100 to express the terms of trade in percentages. Our trade model is a general equilibrium model except for the fact that it deals with only two nations, two commodities, and two factors.

A LOOK AHEAD

In Chapter 5, we extend our trade model in order to identify one of the most important determinants of the difference in the pretrade-relative commodity prices and the comparative advantage among nations. This also allows us to examine the effect that international trade has on the relative price and income of the various factors of production. Our trade model so extended is referred to as the *Heckscher–Ohlin model*. In Chapter 6, we present other more recent trade models.

KEY TERMS

Commodity or net barter terms of trade, p. 94
General equilibrium model, p. 97
Law of reciprocal demand, p. 104
Offer curves, p. 89
Reciprocal demand curves, p. 89
Terms of trade, p. 94
Trade indifference curve, p. 100

QUESTIONS FOR REVIEW

1. How can the supply curve of exports and the demand curve of imports of a commodity be derived from the total demand and supply curves of a commodity in the two nations?

2. How is the equilibrium-relative commodity price with trade determined with demand and supply curves?

3. What is the usefulness of offer curves? How are they related to the trade model of Figure 3.4?

4. What do offer curves show? How are they derived? What is their shape? What explains their shape?

5. How do offer curves define the equilibrium-relative commodity price at which trade takes place?

6. What are the forces that would push any nonequilibrium-relative commodity price toward the equilibrium level?

7. How is a nation's supply curve of its export commodity and demand for its import commodity derived from the nation's production frontier and indifference map?

8. Why does the use of demand and supply curves of the traded commodity refer to partial equilibrium analysis? In what way is partial equilibrium analysis of trade related to general equilibrium analysis?

9. Under what condition will trade take place at the pretrade-relative commodity price in one of the nations?

10. What do the terms of trade measure? What is the relationship between the terms of trade in a world of two trading nations? How are the terms of trade measured in a world of more than two traded commodities?

11. What does an improvement in a nation's terms of trade mean? What effect does this have on the nation's welfare?

12. In what way does our trade model represent a general equilibrium model? In what way does it not? In what ways does our trade model require further extension?

PROBLEMS

1. Show graphically how the equilibrium-relative commodity price of commodity Y with trade can be derived from Figure 4.1.

2. Without looking at the text, derive a nation's offer curve from its production frontier, its indifference map, and two relative commodity prices at which trade could take place (i.e., sketch a figure similar to Figure 4.3).

3. Do the same as Problem 2 for the trade partner (i.e., sketch a figure similar to Figure 4.4).

4. Bring together on another graph the offer curves that you derived in Problems 2 and 3 and determine the equilibrium-relative commodity prices at which trade would take place (i.e., sketch a figure similar to Figure 4.5).

5. In what way is a nation's offer curve similar to:

(a) a demand curve?

(b) a supply curve?

In what way is the offer curve *different* from the usual demand and supply curves?

***6.** Sketch a figure similar to Figure 4.5.

(a) Extend the $P_{F'}$ price line, and the offer curve of Nation 1 until they cross. (In extending it, let the offer curve of Nation 1 bend backward.)

(b) Using the figure you sketched, explain the forces that push $P_{F'}$ toward P_B in terms of commodity Y.

(c) What does the backward-bending (negatively sloped) segment of Nation 1's offer curve indicate?

7. To show how nations can share unequally in the benefits from trade:

(a) Sketch a figure showing the offer curve of a nation having a much greater curvature than the offer curve of its trade partner.

(b) Which nation gains more from trade, the nation with the greater offer curve or the one with the lesser curvature?

(c) Can you explain why?

***8.** From the left panel of Figure 4.4, derive Nation 2's supply curve of exports of commodity Y. From the left panel of Figure 4.3, derive Nation 1's demand curve for Nation 2's exports of commodity Y. Use the demand and supply curves that you derived to show how the equilibrium-relative commodity price of commodity Y with trade is determined.

9. **(a)** Why does the analysis in the answer to Problem 8 refer to partial equilibrium analysis?

(b) Why does the analysis of Figure 4.5 refer to general equilibrium analysis?

(c) What is the relationship between partial and general equilibrium analysis?

***10.** Draw the offer curves for Nation 1 and Nation 2, showing that Nation 2 is a small nation that trades at the pretrade-relative commodity prices in Nation 1. How are the gains from trade distributed between the two nations? Why?

11. Draw a figure showing the equilibrium point with trade for two nations that face constant opportunity costs.

12. Suppose that the terms of trade of a nation improved from 100 to 110 over a given period of time.

(a) By how much did the terms of trade of its trade partner deteriorate?

(b) In what sense can this be said to be unfavorable to the trade partner? Does this mean that the welfare of the trade partner has definitely declined?

13. It has often been said that OPEC (Organization of Petroleum Exporting Countries) operates as a cartel and is able to set petroleum prices by restricting supplies. Do you agree? Explain.

* = Answer provided at www.wiley.com/college/salvatore.

APPENDIX

This appendix presents the formal derivation of offer curves, using a technique perfected by James Meade. In Section A4.1, we derive a trade indifference curve for Nation 1, and in Section A4.2, its trade indifference map. In Section A4.3, Nation 1's offer curve is derived from its trade indifference map and various relative commodity prices at which trade could take place. Section A4.4 outlines the derivation of Nation 2's offer curve in relation to Nation 1's offer curve. In Section A4.5, we present the complete general equilibrium model showing production, consumption, and trade in both nations simultaneously. Finally, in Section A4.6 we examine multiple and unstable equilibria.

A4.1 Derivation of a Trade Indifference Curve for Nation 1

The second (upper-left) quadrant of Figure 4.7 shows the familiar production frontier and community indifference curve I for Nation 1. The only difference between this and Figure 3.3 is that now the production frontier and community indifference curve I are in the second rather than the first quadrant, and quantities are measured from right to left instead of from left to right. (The reason for this will become evident in a moment.) As in Figure 3.3, Nation 1 is in equilibrium at point A in the absence of trade by producing and consuming 50X and 60Y.

Now let us slide Nation 1's production block, or frontier, along indifference curve I so that the production block remains tangent to indifference curve I and the commodity axes are kept parallel at all times. As we do this, the origin of the production block will trace out curve TI (see Figure 4.7). Point A^* is derived from the tangency at A, point B^* from the tangency at B, point W^* from the tangency at W (not shown to keep the figure simple), and point Z^* from the tangency at Z.

Curve TI is Nation 1's trade indifference curve, corresponding to its indifference curve I. TI shows the various trade situations that would keep Nation 1 at the same level of welfare as in the initial no-trade situation. For example, Nation 1 is as well off at point A as at point B, since both points A and B are on the same community indifference curve I. However, at point A, Nation 1 produces and consumes 50X and 60Y without trade. At point B, Nation 1 would produce 130X and 20Y (with reference to the origin at B^*) and consume 30X and 70Y (with reference to the origin at O or A^*) by exporting 100X in exchange for 50Y (see the figure).

Thus, a **trade indifference curve** shows the various trade situations that provide a nation equal welfare. The level of welfare shown by a trade indifference curve is given by the community indifference curve, from which the trade indifference curve is derived. Also note that the slope of the trade indifference curve at any point is equal to the slope at the corresponding point on the community indifference curve from which the trade indifference curve is derived.

A4.2 Derivation of Nation 1's Trade Indifference Map

There is one trade indifference curve for each community indifference curve. Higher community indifference curves (reflecting greater national welfare) will give higher trade indifference curves. Thus, a nation's *trade* indifference map can be derived from its *community* indifference curve map.

Figure 4.8 shows the derivation of trade indifference curve TI from community indifference curve I (as in Figure 4.7) and the derivation of trade indifference curve $TIII$ from

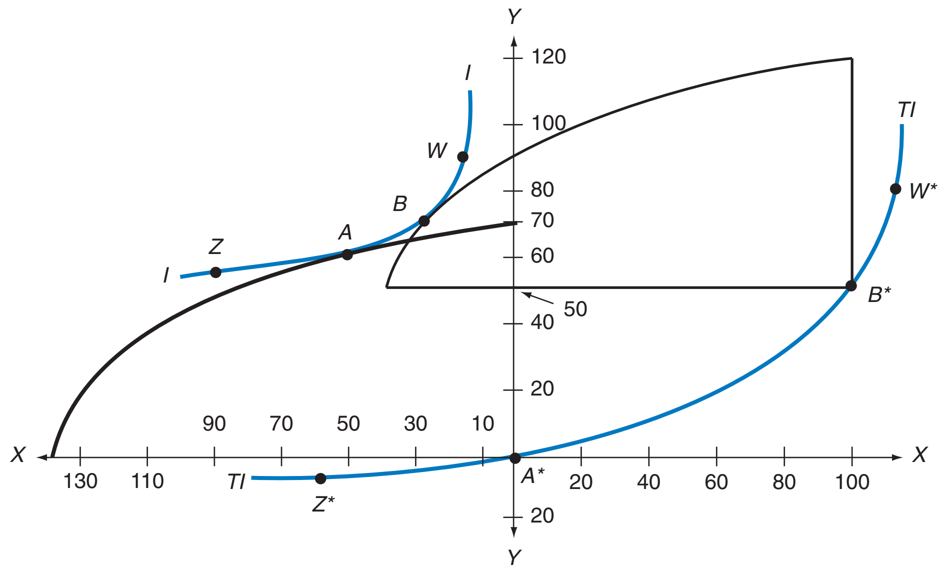

FIGURE 4.7. Derivation of a Trade Indifference Curve for Nation 1.
Trade indifference curve TI is derived by sliding Nation 1's production frontier, or block, along its indifference curve I so that the production block remains tangent to indifference curve I and the commodity axes are kept parallel at all times. As we do this, the *origin* of the production block will trace out TI. This shows the various *trade* situations that would keep Nation 1 at the same level of welfare as in the initial no-trade situation (given by point *A* on indifference curve I).

community indifference curve *III* for Nation 1. Note that community indifference *curve III* is the one shown in Figure 3.2. To reach community indifference curve *III* in Figure 4.8, the production block must be shifted up parallel to the axes until it is tangent to that community indifference curve. Thus, the tangency point *J* gives J^* on *TIII*. Tangency point *E* would give E^* on *TIII*, and so on.

Figure 4.8 shows only the derivation of *TI* and *TIII* (to keep the figure simple). However, for each indifference curve for Nation 1, we could derive the corresponding trade indifference curve and obtain the entire trade indifference map of Nation 1.

A4.3 Formal Derivation of Nation 1's Offer Curve

A nation's offer curve is the locus of tangencies of the relative commodity price lines at which trade could take place with the nation's trade indifference curves. The formal derivation of Nation 1's offer curve is shown in Figure 4.9.

In Figure 4.9, *TI* and *TII* are Nation 1's trade indifference curves, derived from its production block and community indifference curves, as illustrated in Figure 4.8. Lines P_A, P_F, P_B, $P_F{}'$, and $P_A{}'$ from the origin refer to relative prices of commodity X at which trade could take place (as in Figure 4.5).

Joining the origin with tangency points *H, E, R, S*, and *T* gives Nation 1's offer curve. This is the same offer curve that we derived with a simpler technique in Figure 4.3. The only

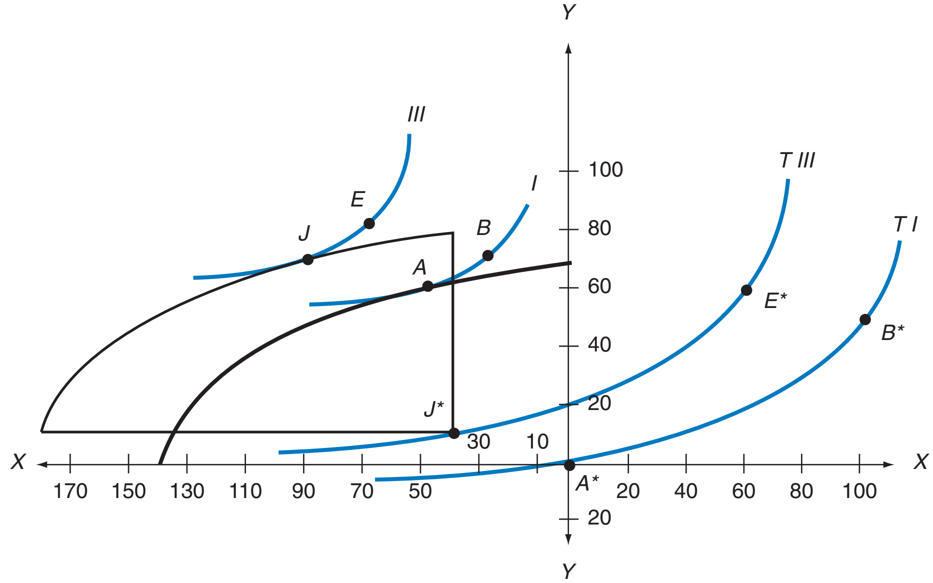

FIGURE 4.8. Derivation of Nation 1's Trade Indifference Map.
Trade indifference curve TI is derived from Nation 1's indifference curve I, as shown in Figure 4.7. Trade indifference curve TIII is similarly derived by sliding Nation 1's production block along its indifference curve III while keeping the axes always parallel. Higher community indifference curve III gives higher trade indifference curve TIII. For each indifference curve, we could derive the corresponding trade indifference curve and obtain the entire trade indifference map of Nation 1.

difference is that now we have derived the top and backward-bending portion of Nation 1's offer curve as well. As defined earlier, Nation 1's offer curve shows the amount of imports of commodity *Y* that Nation 1 demands to be willing to supply various amounts of commodity *X* for export. Note that the greater Nation 1's terms of trade are, the higher is the trade indifference curve reached and the greater is Nation 1's welfare.

From Figure 4.9, we can see that as its terms of trade rise from $P_A = 1/4$ to $P_M = 1\frac{1}{2}$, Nation 1 offers more and more exports of commodity X in exchange for more and more imports of commodity Y. At point *R*, Nation 1 offers the maximum amount of 70X for export. Past point *R*, Nation 1 will only export less and less of commodity X in exchange for more and more imports of commodity Y. The reason for the backward bend in Nation 1's offer curve past point *R* is generally the same as the reason (discussed in Section 4.3B) that gives the offer curve its shape and curvature before the bend. Past point *R*, the opportunity cost of X has risen so much and the marginal rate of substitution of X for Y has fallen so much that Nation 1 is only willing to offer less and less of X for more and more of Y.

The shape of Nation 1's offer curve can also be explained in terms of the substitution and income effects on Nation 1's *home demand* for commodity X. As P_X/P_Y rises, Nation 1 tends to produce more of commodity X and demand less of it. As a result, Nation 1 has more of commodity X available for export. At the same time, as P_X/P_Y rises, the income of Nation 1 tends to rise (because it exports commodity X), and when income rises, more of every normal good is demanded in Nation 1, including commodity X. Thus, by itself, the income effect tends to reduce the amount of commodity X available to Nation 1 for export,

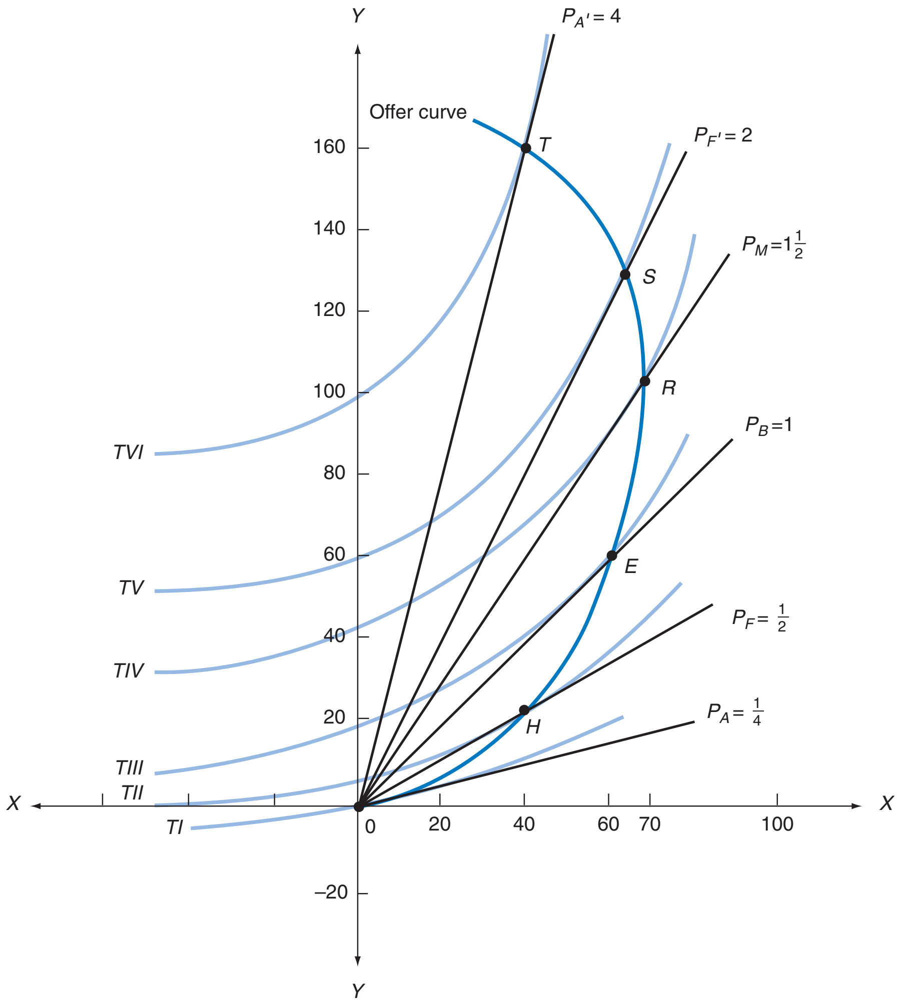

FIGURE 4.9. Formal Derivation of Nation 1's Offer Curve.
Curves TI to TIII are Nation 1's trade indifference curves, derived from its production block and community indifference curves, as illustrated in Figure 4.8. Lines P_A, P_F, P_B, $P_M{}'$, $P_F{}'$, and $P_A{}'$ from the origin refer to relative prices of commodity X at which trade could take place. Joining the origin with tangency points of price lines with trade indifference curves gives Nation 1's offer curve. This is elastic up to point *R*, unitary elastic at point *R*, and inelastic over its backward-bending portion.

while the substitution effect tends to increase it. These effects operate simultaneously. Up to $P_X/P_Y = 1\frac{1}{2}$ (i.e., up to point *R*), the substitution effect overwhelms the opposite income effect, and Nation 1 supplies more of commodity X for export. At $P_X/P_Y > 1\frac{1}{2}$, the income effect overwhelms the opposite substitution effect, and Nation 1 supplies less of commodity X for export (i.e., Nation 1's offer curve bends backward).

Note that Nation 1's offer curve also represents its demand for imports of commodity Y, *not in terms of the price of imports (as along a usual demand curve), but in terms of total expenditures in terms of the nation's exports of commodity X*. As Nation 1's terms of trade rise (and P_Y/P_X falls) so that it demands more imported Y, its expenditures in terms of commodity X rise up to point R, reach the maximum at point R, and fall past R. Thus, the nation's offer curve is elastic up to point R, unitary elastic at point R, and inelastic past point R.

We can now understand (at least intuitively) why the nation with the weaker or less intense demand for the other nation's export commodity has an offer curve with a greater curvature (i.e., less elasticity) and gains more from trade than the nation with the stronger or more intense demand (refer to Problem 5).

This is sometimes referred to as the **law of reciprocal demand**, first expounded numerically by *John Stuart Mill* (another British classical economist) and subsequently generalized and visualized with offer curves, or reciprocal demand curves.

Problem Starting with Nation 1's offer curve, the more advanced student should attempt to sketch (a) Nation 1's demand curve for imports of commodity Y (with P_Y/P_X along the vertical axis) and (b) Nation 1's supply curve for exports of commodity X (with P_X/P_Y along the vertical axis).

A4.4 Outline of the Formal Derivation of Nation 2's Offer Curve

Nation 2's offer curve can be formally derived in a completely analogous way from its trade indifference map and the various relative commodity prices at which trade could take place. This is outlined in Figure 4.10 without repeating the entire process.

Quadrant 2 of Figure 4.10 shows Nation 1's production frontier, or block, and indifference curves I and III, while quadrant 4 shows the same things for Nation 2. Nation 2's production frontier and indifference curves are placed in quadrant 4 so that its offer curve will be derived in the proper relationship to Nation 1's offer curve in quadrant 1.

Nation 1's offer curve in quadrant 1 of Figure 4.10 was derived from its trade indifference map in Figure 4.9. Note that Nation 1's offer curve bends in the same direction as its community indifference curves. In a completely analogous way, Nation 2's offer curve in quadrant 1 of Figure 4.10 can be derived from its trade indifference map and bends in the same direction as its community indifference curves in quadrant 4.

The offer curves of Nation 1 and Nation 2 in quadrant 1 of Figure 4.10 are the offer curves of Figure 4.5 and define the equilibrium-relative commodity price of $P_B = 1$ at their intersection. As will be seen in the next section, only at point E does general equilibrium exist.

Problem Draw a figure showing Nation 2's trade indifference curves that would give its offer curve, including its backward-bending portion.

A4.5 General Equilibrium of Production, Consumption, and Trade

Figure 4.11 brings together in one diagram all the information about production, consumption, and trade for the two nations in equilibrium. The production blocks of Nation 1 and Nation 2 are joined at point E^* (the same as point E in Figure 4.10), where the offer curves of the two nations cross.

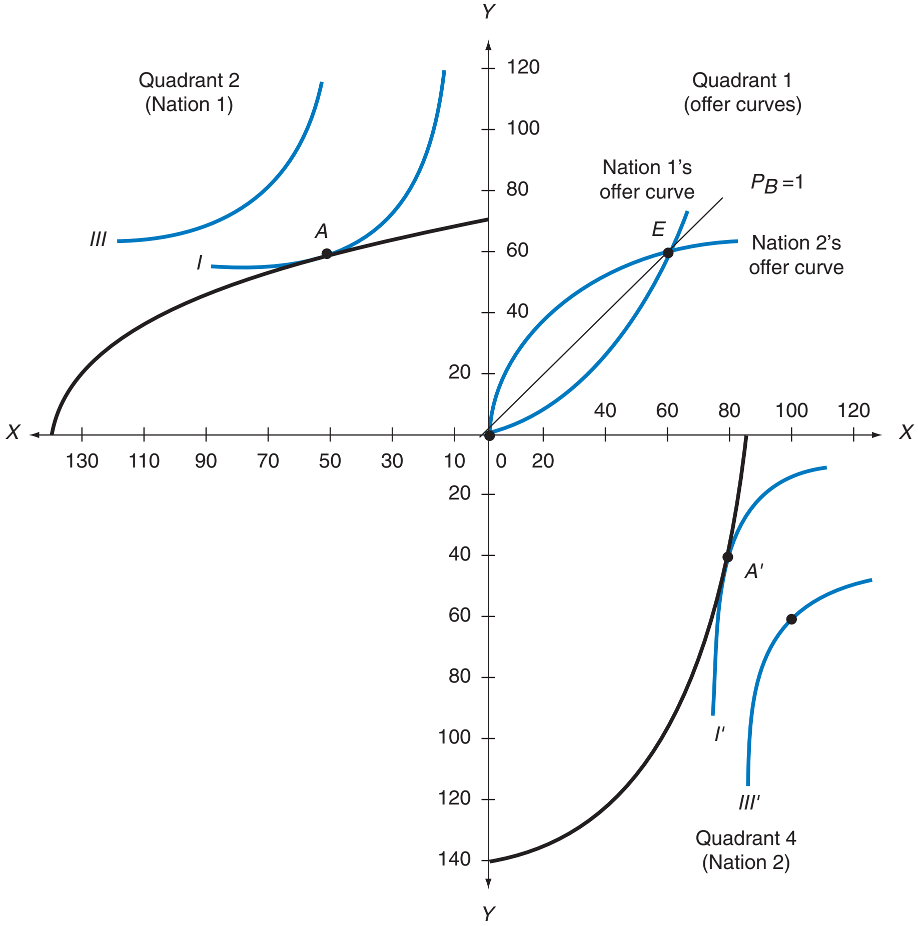

FIGURE 4.10. Outline of the Formal Derivation of Nation 2's Offer Curve.
Nation 2's offer curve can be formally derived from its trade indifference map and the various relative commodity prices at which trade could take place, as was done for Nation 1. This is simply outlined here without repeating the entire process. Thus, Nation 1's offer curve in quadrant 1 is derived from its production block and indifference curves in quadrant 2 and bends in the same direction as its indifference curves. Nation 2's offer curve in quadrant 1 could similarly be derived from its production block and indifference curves in quadrant 4 and bends in the same direction as its indifference curves.

With trade, Nation 1 produces 130X and 20Y (point E with reference to point E^*) and consumes 70X and 80Y (the same point E but with reference to the origin, O) by exchanging 60X and 60Y with Nation 2. On the other hand, Nation 2 produces 40X and 120Y (point E' with reference to point E^*) and consumes 100X and 60Y (the same point E' but with reference to the origin) by exchanging 60Y for 60X with Nation 1.

International trade is in equilibrium with 60X exchanged for 60Y at $P_B = 1$. This is shown by the intersection of offer curves 1 and 2 at point E^*. $P_B = 1$ is also the relative commodity price of X prevailing *domestically* in Nations 1 and 2 (see the relative price line tangent to each nation's production blocks at points E and E', respectively). Thus, producers, consumers, and traders in both nations all respond to the same set of equilibrium-relative commodity prices.

Note that point *E* on Nation 1's indifference curve III measures consumption in relation to the origin, *O*, while the same point *E* on Nation 1's production block measures production from point E^*. Finding Nation 1's indifference curve III tangent to its production block at point *E* seems different but is in fact entirely consistent and confirms the results of Figure 3.4 for Nation 1. The same is true for Nation 2.

Figure 4.11 summarizes and confirms all of our previous results and the conclusions of our trade model (compare, for example, Figure 4.11 with Figure 3.4). Thus, Figure 4.11 is a complete general equilibrium model (except for the fact that it deals with only two nations and two commodities). The figure is admittedly complicated. But this is because it summarizes in a single graph a tremendous amount of very useful information. Figure 4.11 is the pinnacle of the neoclassical trade model. The rewards of mastering it are great indeed in terms of future deeper understanding.

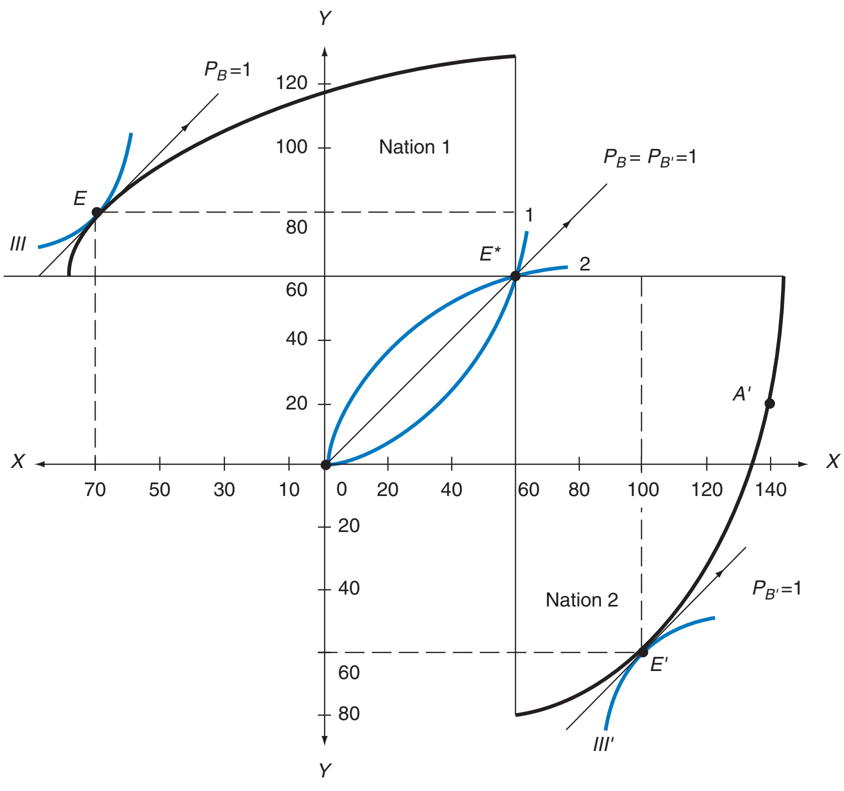

FIGURE 4.11. Meade's General Equilibrium Trade Model.
The production blocks of Nations 1 and 2 are joined at point E^* (the same as point *E* in Figure 4.10), where the offer curves of the two nations cross. With trade, Nation 1 produces 130X and 20Y (point *E* with reference to point E^*) and consumes 70X and 80Y (the same point *E* but with reference to the origin) by exchanging 60X and 60Y with Nation 2. On the other hand, Nation 2 produces 40X and 120Y and consumes 100X and 60Y by exchanging 60Y for 60X with Nation 1. International trade is in equilibrium at point E^*. $P_B = 1$ is the equilibrium-relative commodity price prevailing in international trade and domestically in each nation.

A4.6 Multiple and Unstable Equilibria

In Figure 4.12, offer curve 1 and offer curve 2 intersect at three points (A, B, and C) where at least one of the offer curves is inelastic. Equilibrium points B and C are stable, while equilibrium point A is unstable. The reason is that a small displacement from point A will give rise to economic forces that will automatically shift the equilibrium point farther away from A and toward either B or C.

For example, at P_F, Nation 2 will demand GH more of commodity X than Nation 1 is willing to export at that price. At the same time, Nation 1 will demand FH less of commodity Y than Nation 2 wants to export at P_F. For both reasons, P_X/P_Y will rise until point B is reached. Past point B, Nation 1 will demand more of commodity Y than Nation 2 is willing to offer, and Nation 2 will demand less of commodity X than Nation 1 wants to export, so that P_X/P_Y will fall until the nations have moved back to point B. Thus, point B is a point of stable equilibrium.

On the other hand, if for whatever reason P_X/P_Y falls below P_A (see Figure 4.12), automatic forces will come into play that will push the nations to equilibrium point C, which is also a point of stable equilibrium.

Problem Draw two relative commodity price lines on Figure 4.12, one between point A and point C and one intersecting both offer curves to the right of point C. Starting from each of the two price lines that you have drawn, explain the forces that will automatically push the nations toward equilibrium point C.

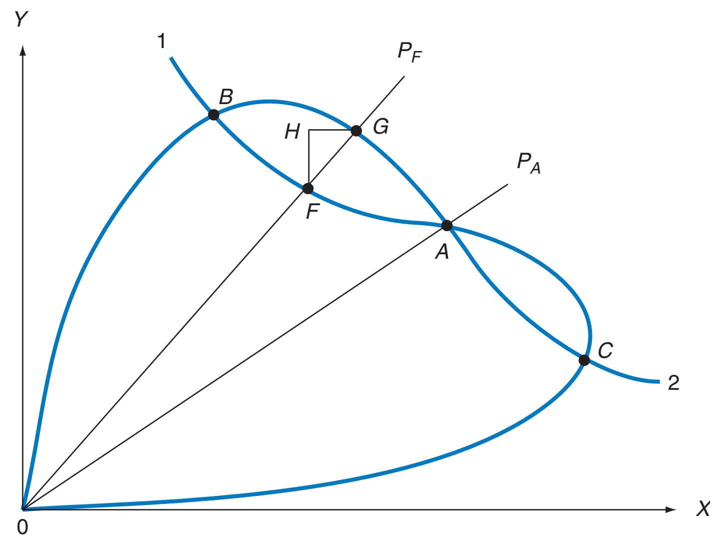

FIGURE 4.12. Stable and Unstable Equilibria.
Equilibrium point A is unstable because any displacement from it will give rise to economic forces that will automatically move the nations even farther away from it and toward either point B or point C. For example, at P_F, Nation 2 demands GH more of commodity X than Nation 1 is willing to export at that price. At the same time, Nation 1 demands FH less of commodity Y than Nation 2 wants to export at P_F. For both reasons, P_X/P_Y will rise until point B is reached. Any small displacement away from point B will push the nations back to point B. On the other hand, if P_X/P_Y falls below P_A, the nations will be pushed toward stable equilibrium point C.

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An excellent discussion of offer curves is found in:

- A. P. Lerner, "The Diagrammatic Representation of Demand Conditions in International Trade," *Economica*, 1934, pp. 319–334.
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For the law of reciprocal demand, see:

- J. S. Mill, *Principles of Political Economy* (New York: Kelly, 1965, a reprint of Mill's 1848 treatise), ch. 18.

For the formal derivation of offer curves perfected by Meade and presented in the appendix to this chapter, see:

- J. E. Meade, *A Geometry of International Trade* (London: George Allen & Unwin, 1952), chs. 1–4.

INTERNet

Online current and historical data on energy prices in general and petroleum prices in particular are available from the Energy Information Administration at:

http://www.eia.doe.gov

Historical series on export and import unit values, which are used to determine the terms of trade of 45 countries, as well as other specific commodity prices, are found in *International Financial Statistics*, published monthly and yearly by the International Monetary Fund (IMF). See:

http://www.imf.org

chapter 5

Factor Endowments and the Heckscher–Ohlin Theory

LEARNING GOALS:

After reading this chapter, you should be able to:

- Explain how comparative advantage is based on differences in factor endowments across nations
- Explain how trade affects relative factor prices within and across nations
- Explain why trade is likely to be only a small reason for higher skilled–unskilled wage inequalities

5.1 Introduction

In this chapter, we extend our trade model in two important directions. First, we explain the basis of (i.e., what determines) comparative advantage. We have seen in previous chapters that the difference in relative commodity prices between two nations is evidence of their comparative advantage and forms the basis for mutually beneficial trade. We now go one step further and explain the reason, or cause, for the difference in relative commodity prices and comparative advantage between the two nations. The second way we extend our trade model is to analyze the effect that international trade has on the earnings of factors of production in the two trading nations. That is, we want to examine the effect of international trade on the earnings of labor as well as on international differences in earnings.

These two important questions were left largely unanswered by Smith, Ricardo, and Mill. According to classical economists, comparative advantage was based on the difference in the *productivity of labor* (the only factor of production they explicitly considered) among nations, but they provided no explanation for such a difference in productivity, except for possible differences in climate. The Heckscher–Ohlin theory goes much beyond that by extending the trade model of the previous two chapters to examine the basis for comparative advantage and the effect that trade has on factor earnings in the two nations.

Section 5.2 deals with the assumptions of the theory. Section 5.3 clarifies the meaning of factor intensity and factor abundance, and explains how the latter is related to factor prices and the shape of the production frontier in each nation.

Section 5.4 presents the Heckscher–Ohlin model proper and illustrates it graphically. The effect of international trade on factor earnings and income distribution in the two nations is examined in Section 5.5. The chapter concludes with Section 5.6, which reviews empirical tests of the Heckscher–Ohlin trade model. The appendix presents the formal derivation of the factor–price equalization theorem and introduces more advanced tools for empirically testing the Heckscher–Ohlin trade model.

5.2 Assumptions of the Theory

The Heckscher–Ohlin theory is based on a number of simplifying assumptions (some made only implicitly by Heckscher and Ohlin). Rather than note these assumptions along the way as they are needed in the analysis, it is both logical and convenient to present them together and explain their meaning at this point. This will not only allow us to view the theory to be presented in a better perspective but will also make the presentation smoother and more direct. To make the theory more realistic, we will relax these assumptions in the next chapter and examine the effect that such relaxation has on the conclusions reached in this chapter.

5.2A The Assumptions

The Heckscher–Ohlin theory is based on the following assumptions:

1. There are two nations (Nation 1 and Nation 2), two commodities (commodity X and commodity Y), and two factors of production (labor and capital).
2. Both nations use the same technology in production.
3. Commodity X is labor intensive, and commodity Y is capital intensive in both nations.
4. Both commodities are produced under constant returns to scale in both nations.
5. There is incomplete specialization in production in both nations.
6. Tastes are equal in both nations.
7. There is perfect competition in both commodities and factor markets in both nations.
8. There is perfect factor mobility within each nation but no international factor mobility.
9. There are no transportation costs, tariffs, or other obstructions to the free flow of international trade.
10. All resources are fully employed in both nations.
11. International trade between the two nations is balanced.

5.2B Meaning of the Assumptions

The meaning of assumption 1 (two nations, two commodities, and two factors) is clear, and it is made in order to be able to illustrate the theory with a two-dimensional figure. This assumption is made with the knowledge (discussed in the next chapter) that its relaxation (so as to deal with the more realistic case of more than two nations, more than two commodities, and more than two factors) will leave the conclusions of the theory basically unchanged.

Assumption 2 (that both nations use the *same technology*) means that both nations have access to and use the same general production techniques. Thus, if factor prices were the same in both nations, producers in both nations would use exactly the same amount of labor and capital in the production of each commodity. Since factor prices usually differ, producers in each nation will use more of the relatively cheaper factor in the nation to minimize their costs of production.

Assumption 3 (that commodity X is labor intensive and commodity Y is capital intensive) means that commodity X requires relatively more labor to produce than commodity Y in both nations. In a more technical and precise way, this means that the labor–capital ratio (L/K) is higher for commodity X than for commodity Y in both nations at the same relative factor prices. This is equivalent to saying that the capital–labor ratio (K/L) is *lower for X than for Y*. But it does not mean that the K/L ratio for X is the same in Nation 1 and Nation 2, only that K/L is lower for X than for Y in both nations. This point is so important that we will use Section 5.3A to clarify it.

Assumption 4 (constant returns to scale in the production of both commodities in both nations) means that increasing the amount of labor and capital used in the production of any commodity will increase output of that commodity in the same proportion. For example, if Nation 1 increases by 10 percent both the amount of labor and the amount of capital that it uses in the production of commodity X, its output of commodity X will also increase by 10 percent. If it doubles the amount of both labor and capital used, its output of X will also double. The same is true for commodity Y and in Nation 2.

Assumption 5 (incomplete specialization in production in both nations) means that even with free trade both nations continue to produce both commodities. This implies that neither of the two nations is "very small."

Assumption 6 (equal tastes in both nations) means that demand preferences, as reflected in the shape and location of indifference curves, are identical in both nations. Thus, when relative commodity prices are equal in the two nations (as, for example, with free trade), both nations will consume X and Y in the same proportion. This is illustrated in Section 5.4C.

Assumption 7 (perfect competition in both commodities and factor markets) means that producers, consumers, and traders of commodity X and commodity Y in both nations are each too small to affect the price of these commodities. The same is true for each user and supplier of labor time and capital. Perfect competition also means that, in the long run, commodity prices equal their costs of production, leaving no (economic) profit after all costs (including implicit costs) are taken into account. Finally, perfect competition means that all producers, consumers, and owners of factors of production have perfect knowledge of commodity prices and factor earnings in all parts of the nation and in all industries.

Assumption 8 (perfect internal factor mobility but no international factor mobility) means that labor and capital are free to move, and indeed do move quickly, from areas and industries of lower earnings to areas and industries of higher earnings until earnings for the same type of labor and capital are the same in all areas, uses, and industries of the nation. On the other hand, there is zero international factor mobility (i.e., no mobility of factors among nations), so that international differences in factor earnings would persist indefinitely in the absence of international trade.

Assumption 9 (no transportation costs, tariffs, or other obstructions to the free flow of international trade) means that specialization in production proceeds until relative (and absolute) commodity prices are the same in both nations with trade. If we allowed for transportation costs and tariffs, specialization would proceed only until relative (and absolute) commodity prices differed by no more than the costs of transportation and the tariff on each unit of the commodity traded.

Assumption 10 (all resources are fully employed in both nations) means that there are no unemployed resources or factors of production in either nation.

Assumption 11 (international trade between the two nations is balanced) means that the total value of each nation's exports equals the total value of the nation's imports.

5.3 Factor Intensity, Factor Abundance, and the Shape of the Production Frontier

Since the Heckscher–Ohlin theory to be presented in Section 5.4 is expressed in terms of factor intensity and factor abundance, it is crucial that the meaning of these terms be very clear and precise. Hence, the meaning of factor intensity is explained and illustrated in Section 5.3A. In Section 5.3B, we examine the meaning of factor abundance and its relationship to factor prices. Finally, in Section 5.3C, we focus on the relationship between factor abundance and the shape of the production frontier of each nation.

5.3A Factor Intensity

In a world of two commodities (X and Y) and two factors (labor and capital), we say that commodity Y is *capital intensive* if the capital–labor ratio (K/L) used in the production of Y is greater than K/L used in the production of X.

For example, if two units of capital ($2K$) and two units of labor ($2L$) are required to produce one unit of commodity Y, the capital–labor ratio is one. That is, $2/2$ in the production of Y. If at the same time $1K$ and $4L$ are required to produce one unit of X, $K/L = 1/4$ for commodity X. Since $K/L = 1$ for Y and $K/L = 1/4$ for X, we say that Y is K intensive and X is L intensive.

Note that it is not the *absolute* amount of capital and labor used in the production of commodities X and Y that is important in measuring the capital and labor intensity of the two commodities, but the amount of capital *per unit of labor* (i.e., K/L). For example, suppose that $3K$ and $12L$ (instead of $1K$ and $4L$) are required to produce 1X, while to produce 1Y requires $2K$ and $2L$ (as indicated earlier). Even though to produce 1X requires $3K$, while to produce 1Y requires only $2K$, commodity Y would still be the K-intensive commodity because K/L is higher for Y than for X. That is, $K/L = 2/2$ for Y, but $K/L = 3/12 = 1/4$ for X.

If we plotted capital (K) along the vertical axis of a graph and labor (L) along the horizontal axis, and production took place along a straight-line ray from the origin, the slope of the line would measure the capital–labor ratio (K/L) in the production of the commodity. This is shown in Figure 5.1.

Figure 5.1 shows that Nation 1 can produce 1Y with $2K$ and $2L$. With $4K$ and $4L$, Nation 1 can produce 2Y because of constant returns to scale (assumption 4). Thus, $K/L = 2/2 = 4/4 = 1$ for Y. This is given by the slope of 1 for the ray from the origin for commodity Y in Nation 1 (see the figure). On the other hand, $1K$ and $4L$ are required to produce 1X, and $2K$ and $8L$ to produce 2X, in Nation 1. Thus, $K/L = 1/4$ for X in Nation 1. This is given by the slope of $1/4$ for the ray from the origin for commodity X in Nation 1. Since K/L, or the slope of the ray from the origin, is higher for commodity Y than for commodity X, we say that commodity Y is K intensive and commodity X is L intensive in Nation 1.

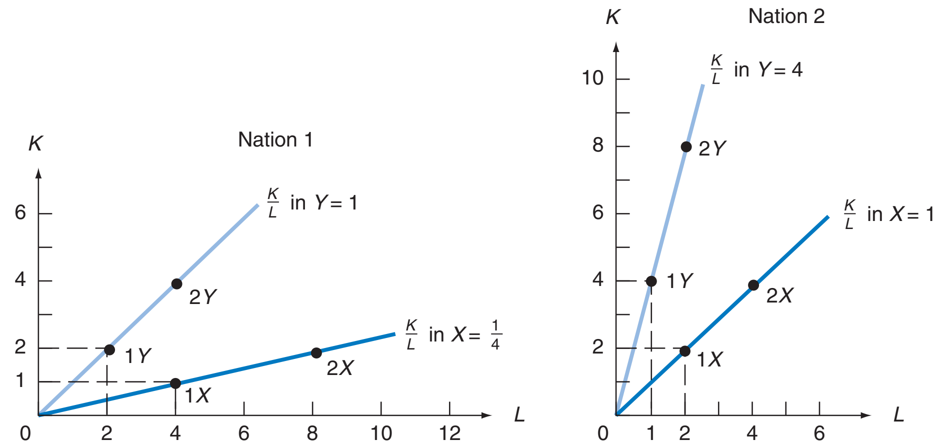


FIGURE 5.1. Factor Intensities for Commodities X and Y in Nations 1 and 2.
In Nation 1, the capital–labor ratio (K/L) equals 1 for commodity Y and $K/L = \frac{1}{4}$ for commodity X. These are given by the slope of the ray from the origin for each commodity in Nation 1. Thus, commodity Y is the K-intensive commodity in Nation 1. In Nation 2, $K/L = 4$ for Y and $K/L = 1$ for X. Thus, commodity Y is the K-intensive commodity, and commodity X is the L-intensive commodity in both nations. Nation 2 uses a higher K/L than Nation 1 in the production of both commodities because the relative price of capital (r/w) is lower in Nation 2. If r/w declined, producers would substitute K for L in the production of both commodities to minimize their costs of production. As a result, K/L would rise for both commodities.

In Nation 2, K/L (or the slope of the ray) is 4 for Y and 1 for X (see Figure 5.1). Therefore, Y is the K-intensive commodity, and X is the L-intensive commodity in Nation 2 also. This is illustrated by the fact that the ray from the origin for commodity Y is steeper (i.e., has a greater slope) than the ray for commodity X in both nations.

Even though commodity Y is K intensive in relation to commodity X in both nations, *Nation 2 uses a higher K/L* in producing both Y and X than Nation 1. For Y, $K/L = 4$ in Nation 2 but $K/L = 1$ in Nation 1. For X, $K/L = 1$ in Nation 2 but $K/L = \frac{1}{4}$ in Nation 1. The obvious question is: Why does Nation 2 use more K-intensive production techniques in both commodities than Nation 1? The answer is that capital must be relatively cheaper in Nation 2 than in Nation 1, so that producers in Nation 2 use relatively more capital in the production of both commodities to minimize their costs of production. But why is capital relatively cheaper in Nation 2? To answer this question, we must define factor abundance and examine its relationship to factor prices.

Before doing this, however, we must settle one other related point of crucial importance. This refers to what happens if, for whatever reason, the relative price of capital falls. Producers would substitute capital for labor in the production of both commodities to minimize their costs of production. As a result, both commodities would become more K intensive. However, only if K/L in the production of commodity Y exceeds K/L in the production of commodity X *at all possible relative factor prices* can we say *unequivocally* that commodity Y is the K-intensive commodity. This is basically an empirical question and will be explored in Section 5.6. For now, we will assume that this is true (i.e., that commodity Y remains the K-intensive commodity at all possible relative factor prices).

To summarize, we say that commodity Y is unequivocally the K-intensive commodity if K/L is higher for commodity Y than for commodity X at all possible relative factor prices.

Nation 2 uses a higher K/L in the production of both commodities because the relative price of capital is lower in Nation 2 than in Nation 1. If the relative price of capital declines, producers will substitute K for L in the production of both commodities to minimize their costs of production. Thus, K/L will rise for both commodities, but Y continues to be the K-intensive commodity.

5.3B Factor Abundance

There are two ways to define factor abundance. One way is in terms of physical *units* (i.e., in terms of the overall amount of capital and labor available to each nation). Another way to define factor abundance is in terms of relative factor prices (i.e., in terms of the rental price of capital and the price of labor time in each nation).

According to the definition in terms of physical units, Nation 2 is capital abundant if the ratio of the total amount of capital to the total amount of labor (*TK/TL*) available in Nation 2 is *greater* than that in Nation 1 (i.e., if *TK/TL* for Nation 2 exceeds *TK/TL* for Nation 1). Note that it is not the absolute amount of capital and labor available in each nation that is important but the *ratio* of the total amount of capital to the total amount of labor. Thus, Nation 2 can have less capital than Nation 1 and still be the capital-abundant nation if *TK/TL* in Nation 2 exceeds *TK/TL* in Nation 1.

According to the definition in terms of factor prices, Nation 2 is capital abundant if the ratio of the rental price of capital to the price of labor time (P_K/P_L) is *lower* in Nation 2 than in Nation 1 (i.e., if P_K/P_L in Nation 2 is smaller than P_K/P_L in Nation 1). Since the rental price of capital is usually taken to be the interest rate (r) while the price of labor time is the wage rate (w), $P_K/P_L = r/w$. Once again, it is not the absolute level of r that determines whether or not a nation is the K-abundant nation, but r/w. For example, r may be higher in Nation 2 than in Nation 1, but Nation 2 will still be the K-abundant nation if r/w is lower there than in Nation 1.

The relationship between the two definitions of factor abundance is clear. The definition of factor abundance in terms of physical units considers only the supply of factors. The definition in terms of relative factor prices considers both demand and supply (since we know from principles of economics that the price of a commodity or factor is determined by both demand and supply considerations under perfect competition). Also from principles of economics, we know that the demand for a factor of production is a derived demand—derived from the demand for the final commodity that requires the factor in its production.

Since we have assumed that tastes, or demand preferences, are the same in both nations, the two definitions of factor abundance give the same conclusions in our case. That is, with *TK/TL* larger in Nation 2 than in Nation 1 in the face of equal demand conditions (and technology), P_K/P_L will be smaller in Nation 2. Thus, Nation 2 is the K-abundant nation in terms of both definitions.

This is not always the case. For example, it is conceivable that the demand for commodity Y (the K-intensive commodity), and therefore the demand for capital, could be so much higher in Nation 2 than in Nation 1 that the relative price of capital would be higher in Nation 2 than in Nation 1 (despite the relatively greater supply of capital in Nation 2). In that case, Nation 2 would be considered K abundant according to the definition in physical terms and L abundant according to the definition in terms of relative factor prices.

In such situations, it is the definition in terms of relative factor prices that should be used. That is, a nation is K abundant if the relative price of capital is lower in it than in the other nation. In our case, there is no such contradiction between the two definitions. Nation 2 is *K* abundant and Nation 1 is *L* abundant in terms of both definitions. We will assume this to be the case throughout the rest of the chapter, unless otherwise explicitly indicated.

5.3c Factor Abundance and the Shape of the Production Frontier

Since Nation 2 is the *K*-abundant nation and commodity Y is the *K*-intensive commodity, Nation 2 can produce *relatively* more of commodity Y than Nation 1. On the other hand, since Nation 1 is the *L*-abundant nation and commodity X is the *L*-intensive commodity, Nation 1 can produce relatively more of commodity X than Nation 2. This gives a production frontier for Nation 1 that is relatively flatter and wider than the production frontier of Nation 2 (if we measure X along the horizontal axis).

In Figure 5.2, we have plotted the production frontiers of Nation 1 and Nation 2 on the same set of axes. (These are the same production frontiers introduced with Figure 3.1 and used throughout Chapters 3 and 4.) Since Nation 1 is the *L*-abundant nation and commodity X is the *L*-intensive commodity, Nation 1's production frontier is skewed toward the horizontal axis, which measures commodity X. On the other hand, since Nation 2 is the *K*-abundant nation and commodity Y is the *K*-intensive commodity, Nation 2's production frontier is skewed toward the vertical axis measuring commodity Y. The production frontiers are plotted on the same set of axes so that the difference in their shape is more clearly evident and because this will facilitate the illustration of the Heckscher–Ohlin model in

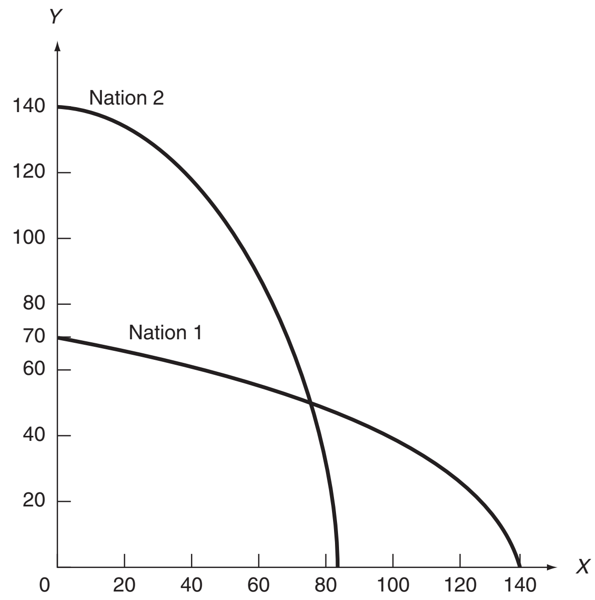


FIGURE 5.2. The Shape of the Production Frontiers of Nation 1 and Nation 2.
The production frontier of Nation 1 is flatter and wider than the production frontier of Nation 2, indicating that Nation 1 can produce relatively more of commodity X than Nation 2. The reason for this is that Nation 1 is the *L*-abundant nation and commodity X is the *L*-intensive commodity.

Section 5.4c. Case Study 5-1 presents the relative resource endowments of various countries, and Case Study 5-2 gives the capital stock per worker for a number of leading developed and developing countries.

CASE STUDY 5-1 Relative Resource Endowments of Various Countries

Table 5.1 gives the share of the world's resource endowments of (1) land, (2) physical capital, (3) research and development (R&D) scientists, (4) highly skilled labor, (5) medium-skilled labor, and (6) unskilled labor, as well as the share of world GDP, for most of the leading developed and developing countries in 2006 (more recent data were not available for all resource endowments). Arable land is the general resource to produce agricultural products; physical capital refers to machinery, factories, and other nonhuman means of production; R&D scientists refers to the most highly skilled labor with more than tertiary (college) education and used to produce the most highly technological products; highly skilled labor is labor that has completed tertiary or college education; unskilled labor is labor that has no education beyond primary education. A nation is broadly defined as having a relative abundance of those factors for which its share of the world availability of that factor exceeds the nation's share of world output (GDP in terms of purchasing power).

The table shows that the U.S. share of the world availability of R&D scientists and highly skilled labor exceeds its share of world GDP; it is about the same as its share of world output for the availability of physical capital, and smaller than its share of world GDP for arable land and

TABLE 5.1. Factor Endowments of Various Countries as a Percentage of the World Total in 2006

Country	(1) Arable Land	(2) Physical Capital	(3) R&D Scientists	(4) Highly Skilled Labor	(5) Medium-Skilled Labor	(6) Unskilled Labor	(7) GDP
United States	12.2%	22.0%	24.1%	22.2%	7.5%	0.4%	21.9%
Japan	0.3	14.1	12.3	10.3	4.2	0.2	7.0
Germany	0.8	6.8	4.9	4.4	3.3	0.5	4.5
United Kingdom	0.4	2.8	3.2	3.4	2.2	0.1	3.4
France	1.3	4.4	3.5	3.1	1.9	0.1	3.3
Italy	0.5	3.5	1.4	1.5	2.3	0.3	2.8
Canada	3.2	3.0	2.2	3.1	0.9	0.1	2.0
China	10.1	11.1	21.1	5.9	25.6	24.9	10.2
India	11.2	4.9	1.6	5.9	9.2	21.7	4.5
Russia	8.5	2.3	8.1	2.8	6.6	0.1	3.0
Brazil	4.2	2.9	1.5	2.6	3.2	2.9	2.7
Korea	0.1	3.3	3.5	2.6	1.7	1.3	1.7
Mexico	1.8	2.0	0.8	3.2	1.5	0.2	2.1
Rest of the World	45.4	16.7	11.7	29.0	28.4	47.2	30.7
World	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: Author's calculations on data from: World Bank, OECD, and United Nations Data Bank.

(continued)

CASE STUDY 5-1 Continued

medium-skilled and unskilled labor. Thus, we would expect the United States to have a net export surplus or comparative advantage in the most highly technological goods that are intensive in R&D scientists and highly skilled labor, to be more or less neutral in capital-intensive goods, and to have a comparative disadvantage in agricultural and other land and natural resource-intensive products, as well as in all types of goods produced with medium-skilled and unskilled labor.

Japan has a relative abundance (and we expect it to have a comparative advantage) in capital-intensive products and in products requiring intensive use of R&D scientists and highly skilled labor; the United Kingdom does not seem to have any relative abundance in broadly defined factors (in fact, the United Kingdom has a relative abundance of highly skilled financial labor). Germany and France have a relative abundance of physical capital and R&D scientists; Italy has a relative abundance in physical capital; and Canada is relatively abundant in arable land, physical capital, R&D scientists, and highly skilled labor.

China has a relative abundance of physical capital but especially of R&D scientists, medium-skilled labor, and unskilled labor; India has a relative abundance of arable land, physical capital, highly skilled, medium-skilled, and unskilled labor; Russia is relatively abundant in arable land, R&D scientists, and medium-skilled labor; Brazil has a relative abundance in all but R&D scientists and highly skilled labor; Korea has a relative abundance in physical capital, R&D scientists, and highly skilled labor; and Mexico is relatively abundant in highly skilled labor.

CASE STUDY 5-2 Capital–Labor Ratios of Selected Countries

Table 5.2 gives the capital stock per worker of a number of developed and developing countries in 2006. Capital stocks are measured in 1990 international dollar prices to reflect the actual purchasing power of the dollar in each country, thus allowing meaningful international comparisons. The table shows that the United States has a lower capital stock per worker than many other industrial or developed countries (the left-hand part of the table) but a much higher capital stock per worker than developing countries (the right-hand part of the table). From Table 5.2, we can thus infer that the United States has a comparative advantage in capital-intensive products with respect to developing countries but not with respect to many other developed or industrial countries. This is broadly consistent with the data presented in Table 5.1.

TABLE 5.2. Capital Stock per Worker of Selected Countries in 2006 (in 1990 International Dollar Prices)

Developed Country	Capital Stock per Worker	Developing Country	Capital Stock per Worker
Japan	$111, 615	Korea	$45, 235
Canada	89, 652	Mexico	23, 921
Germany	87, 400	Turkey	20, 478
France	85, 097	Brazil	16, 650
Italy	73, 966	Russia	16, 131
United States	73, 282	Thailand	11, 688
Spain	51, 814	China	7, 485
United Kingdom	44, 545	India	5, 870

Source: Author's calculations on UN data.

Having clarified the meaning of factor intensity and factor abundance, we are now ready to present the Heckscher–Ohlin theory.

5.4 Factor Endowments and the Heckscher–Ohlin Theory

In 1919, *Eli Heckscher*, a Swedish economist, published an article titled "The Effect of Foreign Trade on the Distribution of Income," in which he presented the outline of what was to become the "modern theory of international trade." The article went largely unnoticed for over ten years until *Bertil Ohlin*, another Swedish economist and former student of Heckscher, picked it up, built on it, clarified it, and in 1933 published his famous book *Interregional and International Trade*.

We will discuss only Ohlin's work, since it incorporates all that Heckscher had said in his article and much more. However, since the essence of the model was first introduced by Heckscher, due credit is given to him by calling the theory the Heckscher–Ohlin theory. Ohlin, for his part, shared (with James Meade) the 1977 Nobel prize in economics for his work in international trade.

The Heckscher–Ohlin (H–O) theory can be presented in a nutshell in the form of two theorems: the so-called *H–O theorem* (which deals with and predicts the pattern of trade) and the *factor–price equalization theorem* (which deals with the effect of international trade on factor prices). The factor–price equalization theorem will be discussed in Section 5.5. In this section, we present and discuss the H–O theorem. We begin with a statement of the theorem and briefly explain its meaning. Then we examine the general equilibrium nature of the H–O theory, and finally we give a geometrical interpretation of the model.

5.4A The Heckscher–Ohlin Theorem

Starting with the assumptions presented in Section 5.2, we can state the Heckscher–Ohlin theorem as follows: *A nation will export the commodity whose production requires the intensive use of the nation's relatively abundant and cheap factor and import the commodity whose production requires the intensive use of the nation's relatively scarce and expensive factor*. In short, the relatively labor-rich nation exports the relatively labor-intensive commodity and imports the relatively capital-intensive commodity.

In terms of our previous discussion, this means that Nation 1 exports commodity X because commodity X is the L-intensive commodity and L is the relatively abundant and cheap factor in Nation 1. Conversely, Nation 2 exports commodity Y because commodity Y is the K-intensive commodity and K is the relatively abundant and cheap factor in Nation 2 (i.e., r/w is lower in Nation 2 than in Nation 1).

Of all the possible reasons for differences in relative commodity prices and comparative advantage among nations, the H–O theorem isolates the difference in relative factor abundance, or *factor endowments*, among nations as the basic cause or determinant of comparative advantage and international trade. For this reason, the H–O model is often referred to as the factor-proportions or factor-endowment theory. That is, each nation specializes in the production and export of the commodity intensive in its relatively abundant and cheap factor and imports the commodity intensive in its relatively scarce and expensive factor.

Thus, the H–O theorem *explains* comparative advantage rather than assuming it (as was the case for classical economists). In other words, the H–O theorem postulates that the difference in relative factor abundance and prices is the *cause* of the pretrade difference in relative commodity prices between two nations. This difference in *relative* factor and *relative* commodity prices is then translated into a difference in *absolute* factor and commodity prices between the two nations (as outlined in Section 2.4D). It is this difference in absolute commodity prices in the two nations that is the *immediate* cause of trade.

5.4B General Equilibrium Framework of the Heckscher–Ohlin Theory

The general equilibrium nature of the H–O theory can be visualized and summarized with the use of Figure 5.3. Starting at the lower right-hand corner of the diagram, we see that tastes and the distribution in the ownership of factors of production (i.e., the distribution of income) together determine the demand for commodities. The demand for commodities determines the derived demand for the factors required to produce them. The demand for factors of production, together with the supply of the factors, determines the price of factors of production under perfect competition. The price of factors of production, together with technology, determines the price of final commodities. The difference in relative commodity prices between nations determines comparative advantage and the pattern of trade (i.e., which nation exports which commodity).

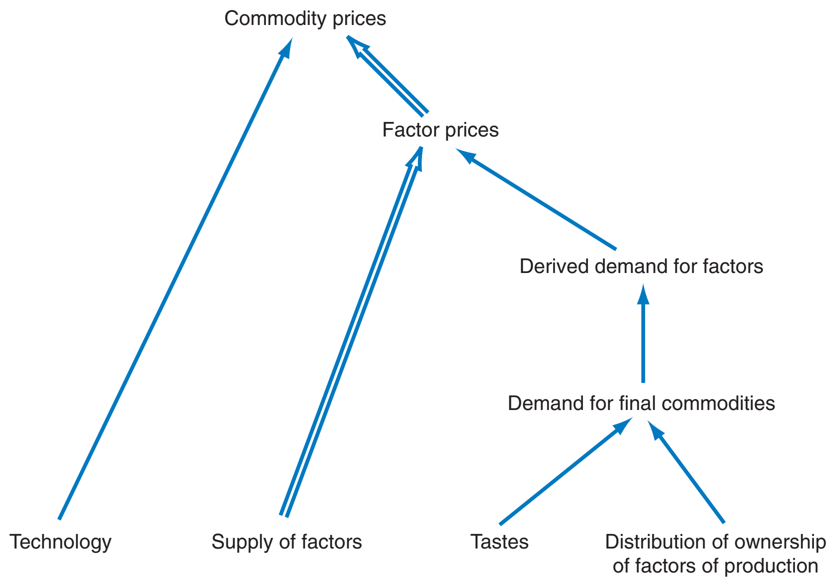


FIGURE 5.3. General Equilibrium Framework of the Heckscher–Ohlin Theory. Beginning at the lower right-hand corner of the diagram, we see that the distribution of ownership of factors of production or income and tastes determines the demand for commodities. The demand for factors of production is then derived from the demand for final commodities. The demand for and supply of factors determine the price of factors. The price of factors and technology determine the price of final commodities. The difference in relative commodity prices among nations then determines comparative advantage and the pattern of trade.

Figure 5.3 shows clearly how all economic forces jointly determine the price of final commodities. This is what is meant when we say that the H–O model is a general equilibrium model.

However, out of all these forces working together, the H–O theorem isolates the difference in the *physical* availability or supply of factors of production among nations (in the face of equal tastes and technology) to explain the difference in relative commodity prices and trade among nations. Specifically, Ohlin assumed equal tastes (and income distribution) among nations. This gave rise to similar demands for final commodities and factors of production in different nations. Thus, it is the difference in the supply of the various factors of production in different nations that is the cause of different relative factor prices in different nations. Finally, the same technology but different factor prices lead to different relative commodity prices and trade among nations. Thus, the difference in the relative supply of factors leading to the difference in relative factor prices and commodity prices is shown by the double lines in Figure 5.3.

Note that the H–O model does not require that tastes, distribution of income, and technology be exactly the same in the two nations for these results to follow. It requires only that they be broadly similar. The assumptions of equal tastes, distribution of income, and technology do simplify the exposition and graphical illustration of the theory. They will be relaxed in Section 6.2.

5.4c Illustration of the Heckscher–Ohlin Theory

The H–O theory is illustrated in Figure 5.4. The left panel of the figure shows the production frontiers of Nation 1 and Nation 2, as in Figure 5.2. As indicated in Section 5.3c, Nation 1's production frontier is skewed along the X-axis because commodity X is the *L*-intensive

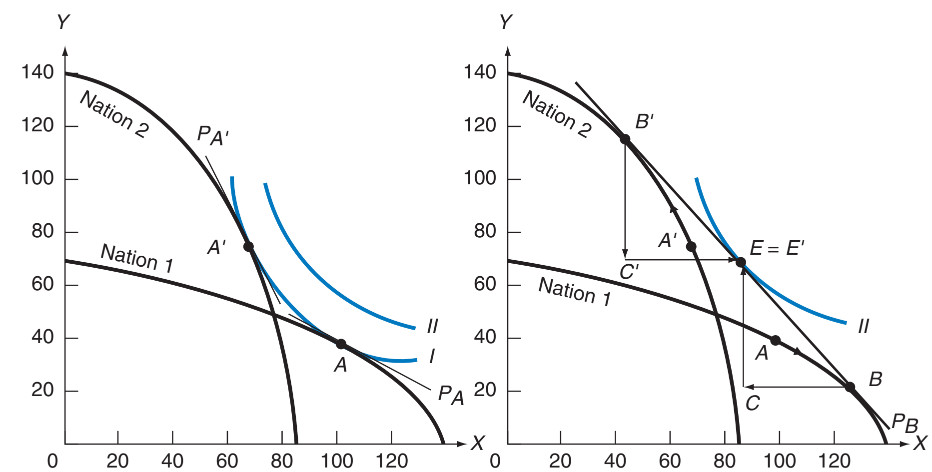


FIGURE 5.4. The Heckscher—Ohlin Model.
Indifference curve *I* is common to both nations because of the assumption of equal tastes. Indifference curve *I* is tangent to the production frontier of Nation 1 at point *A* and tangent to the production frontier of Nation 2 at *A*′. This defines the no-trade equilibrium-relative commodity price of P_A in Nation 1 and $P_{A'}$ in Nation 2 (see the left panel). Since $P_A < P_{A'}$, Nation 1 has a comparative advantage in commodity X and Nation 2 in commodity Y. With trade (see the right panel) Nation 1 produces at point *B* and by exchanging X for Y reaches point *E* in consumption (see trade triangle *BCE*). Nation 2 produces at *B*′ and by exchanging Y for X reaches point *E*′ (which coincides with *E*). Both nations gain from trade because they consume on higher indifference curve *II*.

commodity, Nation 1 is the *L*-abundant nation, and both nations use the same technology. Furthermore, since the two nations have equal tastes, they face the same indifference map. Indifference curve I (which is common for both nations) is tangent to Nation 1's production frontier at point A and to Nation 2's production frontier at A'. Indifference curve I is the highest indifference curve that Nation 1 and Nation 2 can reach in isolation, and points A and A' represent their equilibrium points of production and consumption in the absence of trade. Note that although we assume that the two nations have identical tastes (indifference map), the two nations need not be on the *same* indifference curve in isolation and end up on the same indifference map with trade. We only did so in order to simplify the figure.

The tangency of indifference curve I at points A and A' defines the no-trade, or autarky, equilibrium-relative commodity prices of P_A in Nation 1 and $P_{A'}$ in Nation 2 (see the figure). Since $P_A < P_{A'}$, Nation 1 has a comparative advantage in commodity X, and Nation 2 has a comparative advantage in commodity Y.

The right panel shows that with trade Nation 1 specializes in the production of commodity X, and Nation 2 specializes in the production of commodity Y (see the direction of the arrows on the production frontiers of the two nations). Specialization in production proceeds until Nation 1 has reached point B and Nation 2 has reached point B', where the transformation curves of the two nations are tangent to the common relative price line P_B. Nation 1 will then export commodity X in exchange for commodity Y and consume at point E on indifference curve II (see trade triangle BCE). On the contrary, Nation 2 will export Y for X and consume at point E', which coincides with point E (see trade triangle $B'C'E'$).

Note that Nation 1's exports of commodity X equal Nation 2's imports of commodity X (i.e., $BC = C'E'$). Similarly, Nation 2's exports of commodity Y equal Nation 1's imports of commodity Y (i.e., $B'C' = CE$). At $P_X/P_Y > P_B$, Nation 1 wants to export more of commodity X than Nation 2 wants to import at this high relative price of X, and P_X/P_Y falls toward P_B. On the contrary, at $P_X/P_Y < P_B$, Nation 1 wants to export less of commodity X than Nation 2 wants to import at this low relative price of X, and P_X/P_Y rises toward P_B. This tendency of P_X/P_Y could also be explained in terms of commodity Y.

Also to be noted is that point E involves more of Y but less of X than point A. Nevertheless, Nation 1 gains from trade because point E is on higher indifference curve II. Similarly, even though point E' involves more X but less Y than point A', Nation 2 is also better off because point E' is on higher indifference curve II. This pattern of specialization in production and trade and consumption will remain the same until there is a change in the underlying demand or supply conditions in commodity and factor markets in either or both nations.

It is now instructive briefly to compare Figure 5.4 with Figure 3.4. In Figure 3.4, the difference in the production frontiers of the two nations is reinforced by their difference in tastes, thus making the autarky-relative commodity prices in the two nations differ even more than in Figure 5.4. On the other hand, the tastes of the two nations could be different in such a way as to make mutually beneficial trade impossible. This would occur if the different indifference curves in the two nations were tangent to their respective and different production frontiers in such a way as to result in equal autarky-relative commodity prices in the two nations. This is assigned as end-of-chapter Problem 4, with the answer on the website.

Note also that the H–O theory does not require identical tastes (i.e., equal indifference curves) in the two nations. It only requires that if tastes differ, they do not differ sufficiently to neutralize the tendency of different factor endowments and production possibility curves from leading to different relative commodity prices and comparative advantage in the two nations.

Thus, in a sense, Figure 3.4 can be regarded as a more general illustration of the H–O model than Figure 5.4. Case Study 5-3 identifies the factor intensity of various industries and then Case Study 5-4 examines whether the patterns of trade of some of the leading developed and developing countries conforms to their factor endowments, as predicted by the H–O theory.

CASE STUDY 5-3 Classification of Major Product Categories in Terms of Factor Intensity

Table 5.3 gives the approximate factor intensity of the major product categories entering into international trade. It must be pointed out, however, that in this age of globalization and outsourcing of parts and components from abroad, the overall average factor intensity of a product may be different from that of some of its parts and components.

TABLE 5.3. Factor Intensity of Major Product Categories

Arable Land and Other Natural Resource-Intensive Products:
Agricultural products (food and raw materials)
Fuels and mining products (ores and other minerals, fuels, and nonferrous metals)

Capital-Intensive Products:
Iron and steel
Agricultural chemicals
Automotive products (automotive vehicles, parts, and engines)

R&D Scientists and Other Highly Skilled Labor-Intensive Products:
Chemicals (pharmaceuticals and other chemicals, excluding agricultural)
Office and telecommunications equipment
Civilian aircraft, engines, and parts
Machinery (power generating, nonelectrical, and electrical machinery)
Scientific and controlling instruments

Unskilled Labor-Intensive Products
Textiles
Clothing and footwear
Personal and household goods

Source: World Trade Organizations, *International Trade Statistics*, (Geneva: WTO, 2008); and J. Romalis, ''Factor Proportions and the Structure Commodity of Trade,'' *American Economic Review*, March 2004, pp. 67–97.

CASE STUDY 5-4 The Factor Intensity of Trade of Various Countries

We now look at trade data for the year 2006 to determine the factor intensities of the net exports of the various countries examined in Case Study 5-1 to see if their trade broadly corresponded to their relative factor endowments.

United States: In 2006, the United States had a net export surplus in products intensive in R&D and other highly skilled labor (such as chemicals other than pharmaceuticals, aircrafts, integrated circuits, power-generating machinery, and scientific and controlling instruments), and a net import surplus in some natural resource products (such as fuels) and products intensive in unskilled labor (such as textiles, clothing, and personal and household goods). These correspond to the broad relative factor endowments of the

(continued)

CASE STUDY 5-4 Continued

United States and conform to the predictions of the H–O theory. On the other hand, the United States had a net trade deficit in other products intensive in R&D and highly skilled labor, such as pharmaceuticals, machinery (other than power generating machinery), and office and telecommunications equipment, and a net exporter of agricultural products, when we would have expected the opposite. The United States was also a large net importer of some capital-intensive products (such as iron and steel, and automotive products), in which we would have expected its trade to be more or less balanced.

Japan: Japan had a large net export surplus in capital-intensive products and products intensive in R&D and other highly skilled labor, and a very large net import surplus in products intensive in natural resources and unskilled labor—as expected from Japan's relative factor endowments. Japan also had large net imports surplus of commercial aircrafts.

European Union: As predicted by its relative factor abundance, the European Union (EU-27) had a net export surplus in capital-intensive products and in products intensive in R&D and other highly skilled labor, and a net import surplus in agricultural products, fuels and mining products, textiles and clothing, and personal and household goods. But the EU had also a large net import surplus in office and telecom equipment, which is not in conformity with its relative abundance of R&D and other highly skilled labor.

Canada: Canada's trade was dominated by a very large net export surplus in agricultural products and fuels and mining products, and a large net import surplus of products intensive in unskilled labor as predicted by its relative factor endowments. Contrary to its relative abundance, however, Canada had a net import surplus in almost all other capital and skill-intensive products, except for automotive products (which was mostly in balance).

China: As predicted by its relative factor endowments, China had a large import surplus in agricultural, fuel, and mining products, and a large export surplus in iron and steel, in transport equipment other than automotive, and in office and telecom equipment, electrical machinery, textiles, clothing, and personal and household goods. Contrary to its relative factor endowments, however, China had net import surplus in chemicals other than pharmaceuticals, integrated circuits, automotive products, and power-generating and nonelectrical machinery.

Other Countries: As for the other countries, the trade of India, Russia, Brazil, Korea, and Mexico reflected to a large extent their relative factor endowments, but with some major exceptions.

In summary, we can say that a great deal of the trade of most of the largest developed and developing countries took place as predicted by the factor endowment (H–O) theory, but there were some important exceptions. More rigorous tests of the H–O theory are discussed in Section 5.6. Changes in comparative advantage over time are examined in Chapter 7.

Source: World Trade Organization, *International Trade Statistics*, Geneva, 2008.

5.5 Factor–Price Equalization and Income Distribution

In this section, we examine the *factor–price equalization theorem*, which is really a corollary, since it follows directly from the H–O theorem and holds only if the H–O theorem holds. It was *Paul Samuelson* (1970 Nobel prize in economics) who rigorously proved this factor–price equalization theorem (corollary). For this reason, it is sometimes referred to as the Heckscher–Ohlin–Samuelson theorem (H–O–S theorem, for short).

In Section 5.5A, we state the theorem and explain its meaning. Section 5.5B presents an intuitive proof of the factor–price equalization theorem. In Section 5.5C, we examine the related question of the effect of international trade on the distribution of income within each trading nation. Section 5.5D extends the analysis to the case where one or more factors of production are not mobile but specific to an industry. Finally, in Section 5.5E, we briefly consider the empirical relevance of the factor–price equalization theorem. The rigorous proof of the factor–price equalization theorem and of the specific-factors model are presented in the appendix to this chapter and requires the tools of analysis of intermediate microeconomic theory reviewed in the appendix to Chapter 3.

5.5A The Factor–Price Equalization Theorem

Starting with the assumptions given in Section 5.2A, we can state the factor–price equalization (H–O–S) theorem as follows: *International trade will bring about equalization in the relative and absolute returns to homogeneous factors across nations*. As such, international trade is a substitute for the international mobility of factors.

What this means is that international trade will cause the wages of homogeneous labor (i.e., labor with the same level of training, skills, and productivity) to be the same in all trading nations (if all of the assumptions of Section 5.2A hold). Similarly, international trade will cause the return to homogeneous capital (i.e., capital of the same productivity and risk) to be the same in all trading nations. That is, international trade will make w the same in Nation 1 and Nation 2; similarly, it will cause r to be the same in both nations. Both relative and absolute factor prices will be equalized.

From Section 5.4, we know that in the absence of trade the relative price of commodity X is lower in Nation 1 than in Nation 2 because the relative price of labor, or the wage rate, is lower in Nation 1. As Nation 1 specializes in the production of commodity X (the L-intensive commodity) and reduces its production of commodity Y (the K-intensive commodity), the relative demand for labor rises, causing wages (w) to rise, while the relative demand for capital falls, causing the interest rate (r) to fall. The exact opposite occurs in Nation 2. That is, as Nation 2 specializes in the production of Y and reduces its production of X with trade, its demand for L falls, causing w to fall, while its demand for K rises, causing r to rise.

To summarize, international trade causes w to rise in Nation 1 (the low-wage nation) and to fall in Nation 2 (the high-wage nation). Thus, international trade reduces the pretrade difference in w between the two nations. Similarly, international trade causes r to fall in Nation 1 (the K-expensive nation) and to rise in Nation 2 (the K-cheap nation), thus reducing the pretrade difference in r between the two nations. This proves that international trade *tends to reduce* the pretrade difference in w and r between the two nations.

We can go further and demonstrate that international trade not only tends to reduce the international difference in the returns to homogeneous factors, but would in fact bring about complete equalization in relative factor prices when all of the assumptions made hold. This is so because as long as relative factor prices differ, relative commodity prices differ and trade continues to expand. But the expansion of trade reduces the difference in factor prices between nations. Thus, international trade keeps expanding until relative commodity prices are completely equalized, which means that relative factor prices have also become equal in the two nations.

5.5B Relative and Absolute Factor–Price Equalization

We can show graphically that relative factor prices are equalized by trade in the two nations (if all the assumptions of Section 5.2A hold). In Figure 5.5, the relative price of labor (w/r) is measured along the horizontal axis, and the relative price of commodity X (P_X/P_Y) is measured along the vertical axis. Since each nation operates under perfect competition and uses the same technology, there is a one-to-one relationship between w/r and P_X/P_Y. That is, each w/r ratio is associated with a specific P_X/P_Y ratio.

Before trade, Nation 1 is at point A, with $w/r = (w/r)_1$ and $P_X/P_Y = P_A$, while Nation 2 is at point A', with $w/r = (w/r)_2$ and $P_X/P_Y = P_{A'}$. With w/r lower in Nation 1 than in Nation 2 in the absence of trade, P_A is lower than $P_{A'}$ so that Nation 1 has a comparative advantage in commodity X.

As Nation 1 (the relatively L-abundant nation) specializes in the production of commodity X (the L-intensive commodity) and reduces the production of commodity Y, the demand for labor increases relative to the demand for capital and w/r rises in Nation 1. This causes P_X/P_Y to rise in Nation 1. On the other hand, as Nation 2 (the K-abundant nation) specializes in the production of commodity Y (the K-intensive commodity), its relative demand for capital increases and r/w rises (i.e., w/r falls). This causes P_Y/P_X to rise (i.e., P_X/P_Y to fall) in Nation 2. The process will continue until point $B = B'$, at which $P_B = P_{B'}$ and $w/r = (w/r)^*$ in both nations (see Figure 5.5). Note that $P_B = P_{B'}$ *only if* w/r is identical in the two nations, since both nations operate under perfect competition and use the same technology (by assumption). Note also that $P_B = P_{B'}$ lies between P_A and $P_{A'}$, and

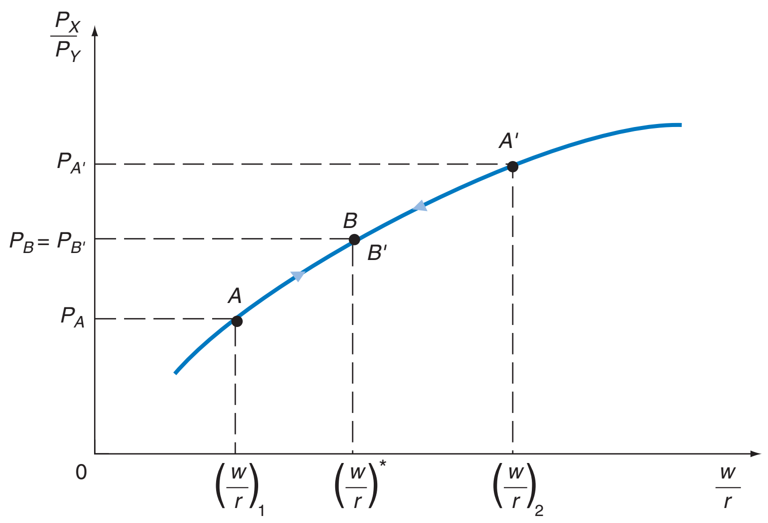


FIGURE 5.5. Relative Factor–Price Equalization.
The horizontal axis measures w/r and the vertical axis P_X/P_Y. Before trade, Nation 1 is at point A, with $w/r = (w/r)_1$ and $P_X/P_Y = P_A$ while Nation 2 is at point A', with $w/r = (w/r)_2$ and $P_X/P_Y = P_{A'}$. Since w/r is lower in Nation 1 than in Nation 2, P_A is lower than $P_{A'}$ so that Nation 1 has a comparative advantage in commodity X. As Nation 1 specializes in the production of commodity X with trade and increases the demand for labor relative to capital, w/r rises. As Nation 2 specializes in the production of commodity Y and increases its relative demand for capital, r/w rises (i.e., w/r falls). This will continue until point $B = B'$, at which $P_B = P_{B'}$ and $w/r = (w/r)^*$ in both nations.

$(w/r)^*$ lies between $(w/r)_1$ and $(w/r)_2$. To summarize, P_X/P_Y will become equal as a result of trade, and this will occur only when w/r has also become equal in the two nations (as long as both nations continue to produce both commodities). A more rigorous and difficult proof of the relative factor–price equalization theorem is given in the appendix.

The preceding paragraph shows the process by which *relative, not absolute*, factor prices are equalized. Equalization of *absolute* factor prices means that free international trade also equalizes the real wages for the same type of labor in the two nations and the real rate of interest for the same type of capital in the two nations. However, given that trade equalizes relative factor prices, that perfect competition exists in all commodity and factor markets, and that both nations use the same technology and face constant returns to scale in the production of both commodities, it follows that trade also equalizes the absolute returns to homogeneous factors. A rigorous and difficult proof of absolute factor–price equalization is presented in the appendix to this chapter, following the proof of relative factor–price equalization.

Note that trade acts as a substitute for the international mobility of factors of production in its effect on factor prices. With perfect mobility (i.e., with complete information and no legal restrictions or transportation costs), labor would migrate from the low-wage nation to the high-wage nation until wages in the two nations became equal. Similarly, capital would move from the low-interest to the high-interest nation until the rate of interest was equalized in the two nations. *While trade operates on the demand for factors, factor mobility operates on the supply of factors*. In either case, the result is complete equalization in the absolute returns of homogeneous factors. With some (rather than perfect) international mobility of factors, a smaller volume of trade would be required to bring about equality in factor returns between the two nations.

5.5c Effect of Trade on the Distribution of Income

In the previous section we examined the effect of international trade on the difference in factor prices *between nations*, but in this section we analyze the effect of international trade on relative factor prices and income *within each nation*. These two questions are certainly related, but they are not the same.

Specifically, we have seen in Section 5.5a that international trade tends to equalize w in the two nations and also to equalize r in the two nations. We now want to examine how international trade affects real wages and the real income of labor in relation to real interest rates and the real income of owners of capital *within* each nation. Do the real wages and income of labor rise or fall in relation to the real interest rates and earnings of owners of capital in the same nation as a result of international trade?

From our discussion in Section 5.5a, we know that trade increases the price of the nation's abundant and cheap factor and reduces the price of its scarce and expensive factor. In terms of our example, w rises and r falls in Nation 1, while w falls and r rises in Nation 2. Since labor and capital are assumed to remain fully employed before and after trade, the real income of labor and the real income of owners of capital move in the same direction as the movement in factor prices. Thus, trade causes the real income of labor to rise and the real income of owners of capital to fall in Nation 1 (the nation with cheap labor and expensive capital). On the other hand, international trade causes the real income of labor to fall and the real income of owners of capital to rise in Nation 2 (the nation with expensive labor and cheap capital). This is the conclusion of the *Stolper–Samuelson theorem*, which is examined in detail in Section 8.4C.

Since in developed nations (e.g., the United States, Germany, Japan, France, Britain, Italy, Canada) capital is the relatively abundant factor (as in our Nation 2), international trade tends to reduce the real income of labor and increase the real income of owners of capital. This is why labor unions in developed nations generally favor trade restrictions. In less developed nations (e.g., India, Egypt, Korea, Mexico), however, labor is the relatively abundant factor, and international trade will increase the real income of labor and reduce the real income of owners of capital.

Since, according to the Heckscher–Ohlin theory, international trade causes real wages and the real income of labor to fall in a capital-abundant and labor-scarce nation such as the United States, shouldn't the U.S. government restrict trade? The answer is almost invariably no. The reason is that the loss that trade causes to labor (particularly unskilled labor; see Case Study 5-5) is less than the gain received by owners of capital. With an appropriate redistribution policy of taxes on owners of capital and subsidies to labor, both broad classes of factors of production can benefit from international trade. Such a redistribution policy can take not only the form of retraining labor displaced by imports but also the form of tax relief for labor and provision of some social services. We return to this important question in our discussion of trade restrictions in Chapters 8 and 9.

CASE STUDY 5-5 Has International Trade Increased U.S. Wage Inequalities?

Has international trade increased wage inequalities between skilled and unskilled workers in the United States and other industrial countries during the past two decades? The answer is yes, but it was probably not a major cause. First, some facts. Between 1979 and 1993, average real wages declined by more than 20 percent for U.S. high school graduates but rose by 11 percent for college graduates, resulting in a large increase in skilled–unskilled workers' real wage inequalities. According to another study, the real wage differential between college and high school graduates in the United States increased by 63 percent between 1973 and 1996. The question is how much did international trade contribute to this increase?

Here there are wide disagreements. Some economists, such as *Wood* (1994, 1995, 1998), *Borjas and Ramey* (1994), *Sachs and Shatz* (1994, 1996), *Rodrik* (1997), and *Feenstra and Hanson* (2009) argue that the growth of manufactured exports from newly industrializing economies (NIEs) was the major cause of the increased wage inequalities in the United States and unemployment in Western Europe between 1980 and 2000. Other economists, such as *Krugman and Lawrence* (1994), *Bhagwati and Kosters* (1994), *Krugman* (1995, 2000), *Slaughter and Wagel* (1997), *Cline* (1997), and *OECD* (1998), however, point out that industrial countries' nonpetroleum imports from low-wage countries are only about 3 percent of their GDP and, hence, it could not possibly have been the major cause of the large fall in the real wages of unskilled workers in the United States and large increase in unemployment (because of more rigid wages) in Western Europe. They acknowledge that international trade certainly contributed to the unskilled workers' problems in industrial countries, but that it played only a minor role in (i.e., it may have been responsible for no more than 10 to 15 percent) the increase in U.S. skilled–unskilled real wage inequalities. Most of the increase in unskilled–skilled real wage inequalities was probably due to technological changes, such as automation and the computerization of many jobs,

(continued)

CASE STUDY 5-5 Continued

which sharply reduced the demand for unskilled workers in the United States and Europe.

The weight of evidence seems to be with this latter view—international trade seems to have had only a small *direct* impact (about 10%) on the demand and wages of unskilled labor in industrial nations from 1980 to 2000. Most of the increase in wage inequality was due to other factors (see Table 5.4). Despite the sharp increase in international trade and off-shoring during the past two decades, *Lawrence* (2008) and *Krugman* (2008) agree with that conclusion, and so does *Lippoldt* (2012). To the extent, however, that international trade and off-shoring led to more rapid technological change, *Ebenstein et al.* (2009) found that their effect on wage inequalities in the United States was much greater and comparable to that of technological change. Also refer to Case Studies 1-3, 3-3, and 3-4.

TABLE 5.4. Sources of Wage Inequalities in the United States

Source of Wage Inequality	Contribution (in percent)
Technological change	37.7
Trade	10.1
Stagnant minimum wage	7.2
Decline of unions	4.4
Immigration	2.9
Unexplained	37.7

Source: "At the Heart of the Trade Debate: Inequity," *The Wall Street Journal*, October 31, 1997, p. A2.

5.5D The Specific-Factors Model

The effect of international trade on the distribution of income discussed in the previous section is based on the assumption that factors are perfectly mobile among the nation's industries or sectors. Although this is likely to be true in the long run, it may not be true in the short run, when some factors (say, capital) may be immobile or specific to some industry or sector. In this case, the conclusions of the Heckscher–Ohlin model on the effects of international trade on distribution need to be modified as explained by the specific-factors model.

In order to examine the specific-factors model, suppose that a nation that is relatively labor-abundant produces two commodities: commodity X, which is L intensive, and commodity Y, which is K intensive. Both commodities are produced with labor and capital, but labor is mobile between the two industries while capital is specific to each industry. That is, the capital used in the production of X (say, food) cannot be used in the production of Y (say, cloth), and vice versa. This is like having three factors of production: labor (which is used in and is mobile between the production of X and Y), natural resources (arable land), which are used only in the production of X, and capital, which is used only in the production of Y.

With the opening of trade, the nation will specialize in the production of and will export commodity X (the labor-intensive commodity) and import commodity Y (the specific capital-intensive commodity). This will increase the relative price of X (i.e., P_X/P_Y) and the demand and nominal wage rate of labor in the nation. Some labor will move from the production of Y to the production of X. Since labor is mobile between the two industries, industry Y will have to pay the higher going nominal wage rate for labor even while facing a reduction in P_Y/P_X and the transfer of some its labor to the production of X.

The effect of this on the *real* wage rate of labor in the nation is ambiguous. The reason is that the increase in P_X/P_Y and in the derived demand for labor will be greater than the increase in the nominal wage rate (since the supply of labor is not vertical—this is explained and shown in Figure 5.9 in the appendix), and so the real wage rate of labor falls in terms of commodity X. On the contrary, since the nominal wage rate increased but the price of commodity Y (the import-competing commodity) declined in the nation, the real wage rate increased in terms of commodity Y. Thus, the real wage rate in the nation falls in terms of X but rises in terms of Y. The effect on the real wage of labor is, therefore, ambiguous. The real wage and income will fall for those workers who consume mainly commodity X and will increase for those workers who consume mainly commodity Y.

The result for specific capital is not ambiguous. Since capital is specific to each industry, opening trade does not lead to any transfer of capital from the production of commodity Y to the production of commodity X in the nation. With more labor used with the given specific capital in the production of X (the nation's export commodity), the real return on capital in the production of X rises. On the contrary, with less labor used with the same amount of specific capital in the production of Y (the nation's import-competing commodity), the real return on the specific capital used in the production of Y falls.

The conclusion reached by the specific-factors model is that trade will have an ambiguous effect on the nation's mobile factors, benefit the immobile factors specific to the nation's export commodities or sectors, and harm the immobile factors specific to the nation's import-competing commodities or sectors. In the previously mentioned example, the opening of trade will have an ambiguous effect on the real wage and income of labor (the nation's mobile factor), will increase the real return on the specific capital used in the production of X (the nation's export commodity), and will reduce the real return on the other specific factor used in the production of commodity Y (the nation's import-competing commodity). If the specific factor used in the production of X was natural resources, then opening of trade would increase the real return or rent on land, reduce the real return on capital used in the production of Y, and have an ambiguous effect on labor. (See Appendix A5.4 for the rigorous proof of this theorem.)

5.5E Empirical Relevance

Has international trade equalized the returns to homogeneous factors in different nations in the real world? Even casual observation clearly indicates that it has not. Thus, wages are much higher for doctors, engineers, technicians, mechanics, secretaries, and laborers in the United States and Germany than in Korea and Mexico.

The reason for this is that many of the simplifying assumptions on which the H–O–S theory rests do not hold in the real world. For example, nations do not use exactly the same technology, and transportation costs and trade barriers prevent the equalization of relative commodity prices in different nations. Furthermore, many industries operate under conditions of imperfect competition and nonconstant returns to scale. It should not be surprising,

CASE STUDY 5-6 Convergence of Real Wages among Industrial Countries

Table 5.5 shows that real hourly wages in manufacturing in the leading industrial countries have converged in U.S. wages over time. Specifically, average wages abroad rose from 27 percent of U.S. wages in 1959 to 43 percent in 1983, 96 percent in 1997, and 103 percent in 2010. Although the rapid expansion of international trade over this period is likely to have been an important reason for the wage convergence, other important forces were also at work, such as the reduction of the technological gap between the United States and the other leading industrial countries, the smaller growth of the labor force in the latter group of countries than in the United States, and increased international labor mobility.

TABLE 5.5. Real Hourly Wage in Manufacturing in the Leading Industrial Countries as a Percentage of the U.S. Wage

Country	1959	1983	1997	2007
Japan	11	24	97	92
Italy	23	42	85	96
France	27	41	108	117
United Kingdom	29	35	80	85
Germany	29	56	126	126
Canada	42	57	82	103
Unweighted average	27	43	96	103
United States	100	100	100	100

Source: U.S. Bureau of Labor Statistics, *Bulletins*. December 2011.

therefore, that international trade has not equalized wages and interest rates for homogeneous factors in different nations.

Under these circumstances, it is more realistic to say that international trade has *reduced*, rather than completely eliminated, the international difference in the returns to homogeneous factors. Although international trade seems to have reduced differences in real wages in manufacturing among the leading industrial countries (see Case Study 5-6), this cannot be regarded as "proof" of the theory, and it is even more difficult to give a clear-cut answer for other countries and other factors.

The reason for this is that, even if international trade has operated to reduce absolute differences in factor returns among nations, many other forces were operating at the same time, preventing any such relationship from becoming clearly evident. For example, while international trade may have tended to reduce the difference in real wages and incomes for the same type of labor between the United States and Egypt, technological advances occurred more rapidly in the United States than in Egypt, so that the difference in earnings has in fact increased. This seems indeed to have been the case between developed nations as a group and most developing nations since World War II.

Once again, this does not disprove the factor–price equalization theorem, since in the absence of trade these international differences might have been much greater than they are now. In any event, the factor–price equalization theorem is useful because it identifies crucial forces affecting factor prices and provides important insights into the general equilibrium nature of our trade model and of economics in general.

One thing the factor–price equalization theorem *does not say* is that international trade will eliminate or reduce international differences in *per capita incomes*. It only predicts that international trade will eliminate or reduce international differences in the returns to *homogeneous factors*. Even if real wages were to be equalized among nations, their per capita incomes could still remain widely different. Per capita income depends on many other forces not directly related to the factor–price equalization theorem. These other forces include the ratio of skilled to unskilled labor, the participation rate in the labor force, the dependency rate, the type of effort made by workers, and so on. For example, Japan has a higher ratio of skilled to unskilled labor than India, a higher participation rate and lower dependency rate, and Japanese workers seem to thrive on work and precision. Thus, even if wages for the same type of labor were exactly the same in Japan and India, Japan would end up with a much higher per capita income than India.

5.6 Empirical Tests of the Heckscher–Ohlin Model

This section presents and evaluates the results of empirical tests of the Heckscher–Ohlin model. A model must be successfully tested empirically before it is accepted as a theory. If a model is contradicted by empirical evidence, it must be rejected and an alternative model drawn up.

In Section 5.6A, we present the results of the original empirical test of the Heckscher–Ohlin model, conducted by *Wassily Leontief*. Since these results seemed to conflict with the model, many attempts were made to reconcile them with the model; in the process numerous other empirical tests were undertaken. These are discussed in Section 5.6B. In Section 5.6C, we look at the situation called *factor-intensity reversal*, which, if very prevalent, would also lead to rejection of the H–O model. Empirical tests, however, indicate that this is not a very frequent occurrence in the real world.

5.6A Empirical Results—The Leontief Paradox

The first empirical test of the Heckscher–Ohlin model was conducted by *Wassily Leontief* in 1951 using U.S. data for the year 1947. Since the United States was the most K-abundant nation in the world, Leontief expected to find that it exported K-intensive commodities and imported L-intensive commodities.

For this test, Leontief utilized the input–output table of the U.S. economy to calculate the amount of labor and capital in a "representative bundle" of $1 million worth of U.S. exports and import substitutes for the year 1947. (The input–output table is a table showing the origin and destination of each product in the economy. Leontief himself had contributed importantly to the development of this new technique of analysis and received the Nobel prize in 1973 for his contributions.)

To be noted is that Leontief estimated K/L for U.S. import substitutes rather than for imports. Import substitutes are commodities, such as automobiles, that the United States produces at home but also imports from abroad (because of incomplete specialization in production). Leontief was forced to use U.S. data on import substitutes because *foreign* production data on actual U.S. imports were not available. However, Leontief correctly reasoned that even though U.S. import substitutes would be more K intensive than actual imports (because K was relatively cheaper in the United States than abroad), they should still be less K intensive than U.S. exports if the H–O model held true. Of course, the use of U.S. data on import substitutes, instead of foreign data on actual U.S. imports, also eliminated from the calculations commodities, such as coffee and bananas, not produced at all in the United States.

The results of Leontief's test were startling. U.S. import substitutes were about 30 percent more K intensive than U.S. exports. That is, the United States seemed to export L-intensive commodities and import K-intensive commodities. This was the opposite of what the H–O model predicted, and it became known as the Leontief paradox (see Case Study 5-7).

CASE STUDY 5-7 Capital and Labor Requirements in U.S. Trade

Table 5.6 gives the capital and labor requirements per million dollars of U.S. exports and import substitutes, as well as the capital/worker-year for imports relative to exports. For example, dividing the capital/worker-year of $18,180 for U.S. import substitutes by the capital/worker-year of $14,010 for exports using 1947 data (see the third row of the table), Leontief obtained the capital/worker-year for imports relative to exports of 1.30. Since the United States is a relatively capital-abundant nation and U.S. import substitutes are more capital intensive than U.S. exports, we have a paradox. Using 1951 trade data, the K/L ratio for imports/exports fell to 1.06, and, excluding natural resource industries, the ratio fell to 0.88 (thus eliminating the paradox). Using 1958 input requirements and 1962 trade data, Baldwin obtained the K/L ratio for imports/exports of 1.27. When natural resource industries were excluded, the ratio fell to 1.04, and when human capital was included, it fell to 0.92 (once again, eliminating the paradox).

TABLE 5.6. Capital and Labor Requirements per Million Dollars of U.S. Exports and Import Substitutes

	Exports	Import Substitutes	Imports/Exports
Leontief			
(1947 input requirements, 1947 trade):			
Capital	$2,550,780	$3,091,339	
Labor (worker-years)	182	170	
Capital/worker-year	$14,010	$18,180	1.30
Leontief			
(1947 input requirements, 1951 trade):			
Capital	$2,256,800	$2,303,400	
Labor (worker-years)	174	168	
Capital/worker-year	$12,977	$13,726	1.06
Capital/worker-year, excluding natural resources			0.88
Baldwin			
(1958 input requirements, 1962 trade):			
Capital	$1,876,000	$2,132,000	
Labor (worker-years)	131	119	
Capital/worker-year	$14,200	$18,000	1.27
Capital/worker-year, excluding natural resources			1.04
Capital/worker-year, excluding natural resources and including human capital			0.92

Sources: Leontief (1951, 1956) and Baldwin (1971). See the Selected Bibliography at the end of the chapter.

In the same study, Leontief tried to rationalize his results rather than reject the H–O model. He argued that what we had here was an optical illusion: Since in 1947 U.S. labor was about three times as productive as foreign labor, the United States was really an *L*-abundant nation if we multiplied the U.S. labor force by 3 and compared this figure to the availability of capital in the nation. Therefore, it was only appropriate that U.S. exports should be *L* intensive in relation to U.S. import substitutes. This explanation is not acceptable, and Leontief himself subsequently withdrew it. The reason is that while U.S. labor was definitely more productive than foreign labor (though the multiple of 3 used by Leontief was largely arbitrary), so was U.S. capital. Therefore, both U.S. labor *and* U.S. capital should be multiplied by a similar multiple, leaving the relative abundance of capital in the United States more or less unaffected.

Similarly invalid is another explanation that postulated that U.S. tastes were biased so strongly in favor of *K*-intensive commodities as to result in higher relative prices for these commodities in the United States. Therefore, the United States would export relatively *L*-intensive commodities. The reason this explanation is not acceptable is that tastes are known to be similar across nations. A study by *Houthakker* in 1957 on household consumption patterns in many countries found that the income elasticity of demand for food, clothing, housing, and other classes of goods was remarkably similar across nations. As a result, this explanation of the Leontief paradox based on a difference in tastes is also unacceptable.

5.6B Explanations of the Leontief Paradox and Other Empirical Tests of the H–O Model

One possible explanation of the paradox is that the year 1947, which Leontief used for the test, was too close to World War II to be representative. Leontief himself answered this criticism by repeating his study in 1956 using the 1947 input–output table of the U.S. economy but 1951 trade data. (The year 1951 is usually taken to mark the completion of postwar reconstruction.) This analysis showed that U.S. exports were only 6 percent more *L* intensive than U.S. import substitutes. Leontief had reduced the paradox but had not eliminated it (see Case Study 5-7).

A more general source of bias is that Leontief used a two-factor model (*L* and *K*), thus abstracting from other factors such as natural resources (soil, climate, mineral deposits, forests, etc.). However, a commodity might be intensive in natural resources so that classifying it as either *K* or *L* intensive (with a two-factor model) would clearly be inappropriate. Furthermore, many production processes using natural resources—such as coal mining, steel production, and farming—also require large amounts of physical capital. The U.S. dependence on imports of many natural resources, therefore, might help explain the large capital intensity of U.S. import-competing industries.

U.S. tariff policy was another source of bias in the Leontief study. A tariff is nothing else than a tax on imports. As such, it reduces imports and stimulates the domestic production of import substitutes. In a 1956 study, *Kravis* found that the most heavily protected industries in the United States were the *L*-intensive industries. This biased the pattern of trade and reduced the labor intensity of U.S. import substitutes, thus contributing to the existence of the Leontief paradox.

Perhaps the most important source of bias was the fact that Leontief included in his measure of capital only physical capital (such as machinery, other equipment, buildings, and so on) and completely ignored human capital. Human capital refers to the education, job training, and health embodied in workers, which increase their productivity. The implication is that since U.S. labor embodies more human capital than foreign labor, adding the human capital component to physical capital would make U.S. exports more K intensive relative to U.S. import substitutes. (In fairness to Leontief, it must be said that the analysis of human capital became fully developed and fashionable only following the work of *Schultz* in 1961 and *Becker* in 1964.)

Somewhat related to human capital is the influence of research and development (R&D) on U.S. exports. The "knowledge" capital resulting from R&D leads to an increase in the value of output derived from a given stock of material and human resources. Even casual observation shows that most U.S. exports are R&D and skill intensive. Thus, human and knowledge capital are important considerations in determining the pattern of U.S. trade. These were not considered by Leontief in his study.

The most important of the numerous empirical studies following a human capital approach were undertaken by Kravis, Keesing, Kenen, and Baldwin. In two studies published in 1956, *Kravis* found that wages in U.S. exports industries in both 1947 and 1951 were about 15 percent higher than wages in U.S. import-competing industries. Kravis correctly argued that the higher wages in U.S. exports industries were a reflection of the greater productivity and human capital embodied in U.S. exports than in U.S. import substitutes.

In a 1966 study, *Keesing* found that U.S. exports were more skill intensive than the exports of nine other industrial nations for the year 1957. This reflected the fact that the United States had the most highly trained labor force, embodying more human capital than other nations.

It remained for *Kenen*, in a 1965 study, to actually estimate the human capital embodied in U.S. exports and import-competing goods, add these estimates to the physical capital requirements, and then recompute K/L for U.S. exports and U.S. import substitutes. Using 1947 data and without excluding products with an important natural resource content (as in the original Leontief study), Kenen succeeded in eliminating the Leontief paradox.

In a 1971 study, *Baldwin* updated Leontief's study by using the 1958 U.S. input–output table and U.S. trade data for 1962. Baldwin found that excluding natural resource industries was not sufficient to eliminate the paradox unless human capital was included (see Case Study 5-7). The paradox remained, however, for developing nations and for Canada. Similar paradoxical results arose by using other countries' data. A 1977 study by *Branson and Monoyios* also raised some questions on the appropriateness of combining human and physical capital into a single measure for the purpose of testing the H–O trade model.

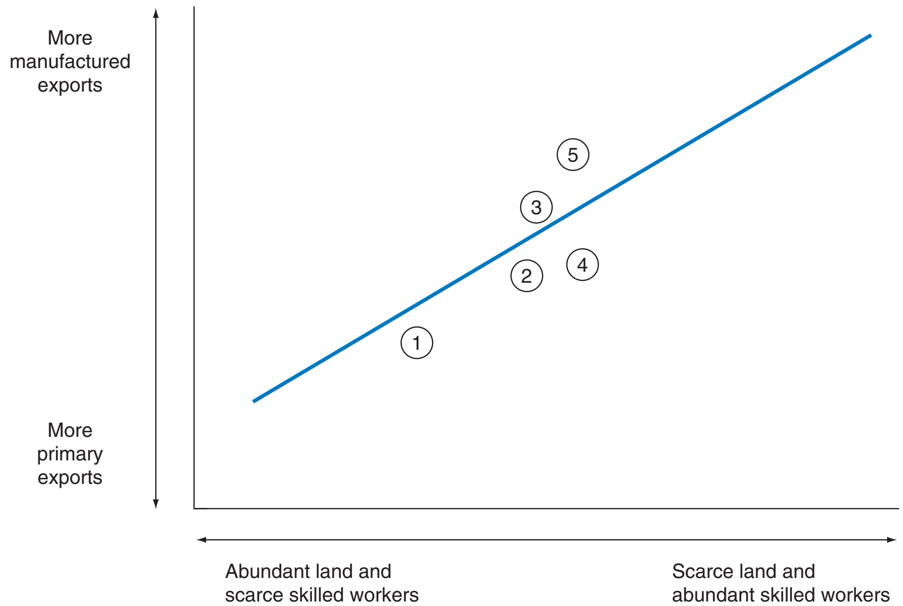
In 1980 and 1984 publications, *Leamer* argued that in a multifactor world we should compare the K/L ratio in production versus consumption rather than in exports versus imports. Taking this approach to Leontief's 1947 data, *Leamer* (1984) found that the K/L ratio embodied in U.S. production was indeed greater than that embodied in U.S. consumption, so that the paradox disappeared. This was confirmed in a 1981 study by *Stern and Maskus* for the year 1972 and in a 1990 study by *Salvatore and Barazesh* for each year from 1958 to 1981 when natural resource industries were excluded.

In a 1987 study, however, *Bowen, Leamer, and Sveikauskas*, using more complete 1967 cross-sectional data on trade, factor-input requirements, and factor endowments for 27 countries, 12 factors (resources), and many commodities, found that the H–O trade model was supported only about half of the time. This seemed to inflict a devastating blow on the validity of the H–O model. Subsequent research, however, does provide support for some restricted form of the H–O trade model. In a 1993 study, *Brecher and*

Choudhri found production evidence in support of the H–O model for U.S.–Canadian trade; a 1994 study by *Wood* provided support for the H–O model for trade between developed and developing countries based on differences in their relative availability of skills and land, and so did a 1995 study by the World Bank (see Case Study 5-8).

CASE STUDY 5-8 The H–O Model with Skills and Land

Figure 5.6 shows that Africa (1) with relatively more abundant land and fewer skilled workers exports more primary commodities, whereas industrial market economies (5) with relatively more skilled workers export more manufactured goods. Between Africa and industrial countries lie Latin America (2), South Asia (3), and East Asia (4), which have relatively less land and more skilled workers than Africa and export relatively more manufactured goods than Africa but fewer than industrial countries. The straight line in the figure is the regression line showing the general relationship between relative factor endowments and type of exports. It was estimated for the year 1985 from 126 data points (not shown in the figure), each referring to a country, and it shows a clear positive relationship between skill availability and exports of manufactures. The numbered circles in the figure show regional averages.



Legend:
(1) Sub-Saharan Africa; (2) Latin America and the Caribbean; (3) South Asia; (4) East Asia and the Pacific; (5) Industrial market economies

FIGURE 5.6. Comparative Advantage with Skills and Land.
The regression line shows that Africa with relatively more land and fewer skilled workers than other regions exports more primary commodities and fewer manufactured goods than other regions.
Source: World Bank, *World Development Report,* Washington, D.C., 1995, p. 59.

Additional evidence in support of the H–O model for trade in manufactured goods among the largest industrial countries was also provided in 1996 by *James and Elmslie*, and more broadly, but still qualified, by *Leamer* (1993), *Leamer and Levinsohn* (1995), and *Wood* (1997).

More convincing evidence validating a qualified or restricted form of the H–O theory comes from more recent research. Using data on a large sample of developed and developing countries over the 1970–1992 period and allowing for differences in technology among nations, *Harrigan and Zakrajsek* (2000) show that factor endowments do explain comparative advantage. *Schott* (2003, p. 686) provides "strong support for H–O specialization" by utilizing more disaggregated data, which shows that countries specialize in the particular subset of goods most suited to their specific factor endowments (showing, for example, that considering all electrical machinery as hi-tech, as done in previous studies, was wrong because electrical machinery also includes portable radios assembled by hand).

Additional evidence is provided by *Davis and Weinstein* (2001). They utilized the trade data of ten countries (the United States, Japan, Germany, France, the United Kingdom, Italy, Canada, Australia, Denmark, and the Netherlands) with the rest of the world. For 34 sectors, over the 1970–1995 period, and allowing for different technologies and factor prices across countries, the existence of nontraded goods, and transportation costs, *Davis and Weinstein* show that countries export commodities intensive in their relatively abundant and cheap factors of production and they do so in the predicted magnitudes.

More evidence is provided by *Romalis* (2004). By using a many-country version of the Heckscher–Ohlin model with differentiated products and transportation costs, and detailed bilateral trade data, *Romalis* (p. 67) conclude, "Countries capture larger shares of world production and trade in commodities that more intensively use their abundant factor. Countries that rapidly accumulate a factor see their production and export structures systematically shift towards industries that intensively use that factor."

Some support for the Heckscher–Ohlin model was also provided by Morrow (2010) using panel data across 20 developed and developing countries over the 1985–1995 period by considering also relative labor productivity differences across 24 manufacturing industries (besides differences in factor endowments across nations). *Chor* (2010) provided additional evidence by including relative institutional strengths of different countries. *Trefler and Zhu* (2010) showed more support by using "the correct" (i.e., a better) definition of factor content and input–output tables for 41 developed and developing countries for 24 industries for the year 1997.

Thus, it seems (see Baldwin, 2008, pp. 174–175) that we can retain the traditional Hecksher–Ohlin model for explaining trade between developed and developing countries (often referred to as North–South trade) and a qualified or restricted version of the H–O model for the much larger volume of trade among developed countries (i.e., North–North trade) if the model is extended to allow for different technologies and factor prices across countries, as well as the existence of nontraded goods, economies of scale, product differentiation, and transportation costs. But then some would argue that not much is left from the original H–O model and that all we have is a general factor-endowments trade model. The next chapter will examine economies of scale, product differentiation, and technological differences as additional or complementary factors determining comparative advantage and international trade.

5.6c Factor-Intensity Reversal

Factor-intensity reversal refers to the situation where a given commodity is the *L*-intensive commodity in the *L*-abundant nation and the *K*-intensive commodity in the *K*-abundant nation. For example, factor-intensity reversal is present if commodity X is the *L*-intensive commodity in Nation 1 (the low-wage nation), and, at the same time, it is the *K*-intensive commodity in Nation 2 (the high-wage nation).

To determine when and why factor-intensity reversal occurs, we use the concept of the elasticity of substitution of factors in production. The elasticity of substitution measures the degree or ease with which one factor can be substituted for another in production as the relative price of the factor declines. For example, suppose that the elasticity of substitution of *L* for *K* is much greater in the production of commodity X than in the production of commodity Y. This means that it is much easier to substitute *L* for *K* (or vice versa) in the production of commodity X than in the production of commodity Y.

Factor-intensity reversal is more likely to occur the greater is the *difference* in the elasticity of substitution of *L* for *K* in the production of the two commodities. With a large elasticity of substitution of *L* for *K* in the production of commodity X, Nation 1 will produce commodity X with *L*-intensive techniques because its wages are low. On the other hand, Nation 2 will produce commodity X with *K*-intensive techniques because its wages are high. If at the same time the elasticity of substitution of *L* for *K* is very low in the production of commodity Y, the two nations will be forced to use similar techniques in producing commodity Y even though their relative factor prices may differ greatly. As a result, commodity X will be the *L*-intensive commodity in Nation 1 and the *K*-intensive commodity in Nation 2, and we have a case of factor-intensity reversal.

When factor-intensity reversal is present, neither the H–O theorem nor the factor–price equalization theorem holds. The H–O model fails because it would predict that Nation 1 (the *L*-abundant nation) would export commodity X (its *L*-intensive commodity) and that Nation 2 (the *K*-abundant nation) would also export commodity X (its *K*-intensive commodity). Since the two nations cannot possibly export the same *homogeneous* commodity to each other, the H–O model no longer predicts the pattern of trade.

With factor-intensity reversal, the factor–price equalization theorem also fails to hold. The reason for this is that as Nation 1 specializes in the production of commodity X and demands more *L*, the relative and the absolute wage rate will rise in Nation 1 (the low-wage nation). Conversely, since Nation 2 cannot export commodity X to Nation 1, it will have to specialize in the production of and export commodity Y. Since commodity Y is the *L*-intensive commodity in Nation 2, the demand for *L* and thus wages will also rise in Nation 2. What happens to the *difference* in relative and absolute wages between Nation 1 and Nation 2 depends on how fast wages rise in each nation. The difference in relative and absolute wages between the two nations could decline, increase, or remain unchanged as a result of international trade, so that the factor–price equalization theorem no longer holds.

That factor-intensity reversal does occur in the real world is beyond doubt. The question is how prevalent it is. If factor reversal is very prevalent, the entire H–O theory must be rejected. If it occurs but rarely, we can retain the H–O model and treat factor reversal as an exception. The frequency of factor reversal in the real world is an empirical question.

The first empirical research on this topic was a study conducted by *Minhas* in 1962, in which he found factor reversal to be fairly prevalent, occurring in about one-third of the cases that he studied. However, by correcting an important source of bias in the Minhas study, Leontief showed in 1964 that factor reversal occurred in only about 8 percent of the cases studied, and that if two industries with an important natural resource content were excluded, factor reversal occurred in only 1 percent of the cases.

A study by *Ball*, published in 1966 and testing another aspect of Minhas's results, confirmed Leontief's conclusion that factor-intensity reversal seems to be a rather rare occurrence in the real world. As a result, the assumption that one commodity is L intensive and the other commodity is K intensive (assumption 3 in Section 5.2) at all *relevant* relative factor prices generally holds, so that the H–O model can be retained.

SUMMARY

1. The Heckscher–Ohlin theory presented in this chapter extends our trade model of previous chapters to explain the basis of (i.e., what determines) comparative advantage and to examine the effect of international trade on the earnings of factors of production. These two important questions were left largely unanswered by classical economists.

2. The Heckscher–Ohlin theory is based on a number of simplifying assumptions (some made only implicitly by Heckscher and Ohlin). These are (1) two nations, two commodities, and two factors of production; (2) both nations use the same technology; (3) the same commodity is labor intensive in both nations; (4) constant returns to scale; (5) incomplete specialization in production; (6) equal tastes in both nations; (7) perfect competition in both commodities and factor markets; (8) perfect internal but no international mobility of factors; (9) no transportation costs, tariffs, or other obstructions to the free flow of international trade; (10) all resources are fully employed; and (11) trade is balanced. These assumptions will be relaxed in Chapter 6.

3. In a world of two nations (Nation 1 and Nation 2), two commodities (X and Y), and two factors (labor and capital), we say that commodity Y is capital intensive if the capital–labor ratio (K/L) used in the production of Y is greater than K/L for X in both nations. We also say that Nation 2 is the K-abundant nation if the relative price of capital (r/w) is *lower* there than in Nation 1. Thus, Nation 2's production frontier is skewed toward the Y-axis and Nation 1's is skewed toward the X-axis. Since the relative price of capital is lower in Nation 2, producers there will use more K-intensive techniques in the production of both commodities in relation to Nation 1. Producers would also substitute K for L (causing K/L to rise) in the production of both commodities if the relative price of capital declined. Commodity Y is *unequivocally* the K-intensive commodity if K/L remains higher for Y than for X in both nations at all relative factor prices.

4. The Heckscher–Ohlin, or factor-endowment, theory can be expressed in terms of two theorems. According to the H–O theorem, a nation will export the commodity intensive in its relatively abundant and cheap factor and import the commodity intensive in its relatively scarce and expensive factor. According to the factor–price equalization (H–O–S) theorem, international trade will bring about equalization of relative and absolute returns to homogeneous factors across nations. If some factors are specific (i.e., can only be used in some industries), the specific-factors model postulates that trade will have an ambiguous effect on the nation's mobile factors: It will benefit the immobile factors that are specific to the nation's export commodities or sectors, and harm the immobile factors that are specific to the nation's import-competing commodities or sectors.

5. Out of all the possible forces that could cause a difference in pretrade-relative commodity prices between nations, Heckscher and Ohlin isolate the difference in factor endowments (in the face of equal technology and tastes) as the basic determinant or cause of comparative advantage. International trade can also be a substitute for the international mobility of factors in equalizing relative and absolute returns to homogeneous factors across nations. The general equilibrium nature of the H–O theory arises from the fact that all commodity and factor markets are components of an overall unified system so that a change in any part affects every other part.

6. The first empirical test of the H–O model was conducted by Leontief using 1947 U.S. data. Leontief found that U.S. import substitutes were about 30 percent more K intensive than U.S. exports. Since the United States is the most K-abundant nation, this result was the opposite of what the H–O model predicted; this became known as the Leontief paradox. Empirical results seem to show that the traditional Heckscher–Ohlin model can explain trade between developed and developing countries (often referred to as North–South trade) and a highly qualified or restricted version of the H–O can model the much larger trade among developed countries (i.e., North–North trade).

7. Factor-intensity reversal refers to the situation where a commodity is L intensive in the L-abundant nation and K intensive in the K-abundant nation. This may occur when the elasticity of substitution of factors in production varies greatly for the two commodities. With factor reversal, both the H–O theorem and the factor–price equalization theorem fail. Minhas conducted a test in 1962 that showed that factor reversal was fairly prevalent. Leontief and Ball demonstrated, however, that Minhas's results were biased and that factor reversal was a rather rare occurrence.

A LOOK AHEAD

In Chapter 6, we relax the assumptions of the Heckscher–Ohlin model and examine complementary trade theories that base international trade on economies of scale and imperfect competition, and we evaluate their relative importance as explanations of international trade today. We will also look at the effect of transportation costs and environmental standards on international trade and the relationship between transportation costs and environmental standards on the location of industry.

KEY TERMS

Capital-intensive commodity, p. 111
Capital–labor ratio (K/L), p. 111
Cobb–Douglas production function, p. 151
Constant elasticity of substitution (CES) production function, p. 151
Constant returns to scale, p. 111
Derived demand, p. 114
Elasticity of substitution, p. 137
Euler's theorem, p. 145
Factor abundance, p. 114
Factor-intensity reversal, p. 137
Factor–price equalization (H–O–S) theorem, p. 124
Factor-proportions or factor-endowment theory, p. 118
Heckscher–Ohlin (H–O) theorem, p. 118
Heckscher–Ohlin (H–O) theory, p. 118
Human capital, p. 134
Import substitutes, p. 131
Input–output table, p. 131
Internal factor mobility, p. 111
International factor mobility, p. 111
Labor–capital ratio (L/K), p. 111
Labor-intensive commodity, p. 111
Leontief paradox, p. 132
Perfect competition, p. 111
Relative factor prices, p. 114
Specific-factors model, p. 128

QUESTIONS FOR REVIEW

1. In what ways does the Heckscher–Ohlin theory represent an extension of the trade model presented in the previous chapters? What did classical economists say on these matters?

2. State the assumptions of the Heckscher–Ohlin theory. What is the meaning and importance of each of these assumptions?

3. What is meant by labor-intensive commodity? Capital-intensive commodity? Capital–labor ratio?

4. What is meant by capital-abundant nation? What determines the shape of the production frontier of each nation?

5. What determines the capital–labor ratio in the production of each commodity in both nations? Which of the two nations would you expect to use a higher capital–labor ratio in the production of both commodities? Why? Under what circumstance would the capital–labor ratio be the same in the production of both commodities in each nation?

6. If labor and capital can be substituted for each other in the production of both commodities, when can we say that one commodity is capital intensive and the other labor intensive?

7. What does the Heckscher–Ohlin theory postulate? Which force do Heckscher and Ohlin identify as the basic determinant of comparative advantage and trade?

8. What does the factor–price equalization theorem postulate? What is its relationship to the international mobility of factors of production?

9. Explain why the Heckscher–Ohlin theory is a general equilibrium model.

10. What is meant by the Leontief paradox? What are some possible explanations of the paradox? How can human capital contribute to the explanation of the paradox?

11. What were the results of empirical tests on the relationship between human capital and international trade? Natural resources and international trade? What is the status of the H–O theory today?

12. What is meant by factor-intensity reversal? How is this related to the elasticity of substitution of factors in production? Why would the prevalence of factor reversal lead to rejection of the H–O theorem and the factor–price equalization theorem? What were the results of empirical tests on the prevalence of factor reversal in the real world?

13. Did more recent research confirm or reject the H–O model?

PROBLEMS

1. Draw two sets of axes, one for Nation 1 and the other for Nation 2, measuring labor along the horizontal axis and capital along the vertical axis.

(a) Show by straight lines through the origin that K/L is higher for commodity Y than for commodity X in both nations in the absence of trade and that K/L is higher in Nation 2 than in Nation 1 for both commodities.

(b) What happens to the slope of the lines measuring K/L of each commodity in Nation 2 if r/w rises in Nation 2 as a result of international trade?

(c) What happens to the slope of the lines measuring K/L in Nation 1 if r/w falls in Nation 1 as a result of international trade?

(d) Given the results of parts b and c, does international trade increase or reduce the difference in the K/L in the production of each commodity in the two nations as compared with the pretrade situation?

2. Without looking at the text,

(a) Sketch a figure similar to Figure 5.4 showing the autarky equilibrium point in each nation and the point of production and consumption in each nation with trade.

(b) With reference to your figure in part a, explain what determines the comparative advantage of each nation.

(c) Why do the two nations consume different amounts of the two commodities in the absence of trade but the same amount with trade?

3. Starting with the production frontiers for Nation 1 and Nation 2 shown in Figure 5.4, show graphically that even with a small difference in tastes in the two nations, Nation 1 would continue to have a comparative advantage in commodity X.

***4.** Starting with the production frontiers for Nation 1 and Nation 2 shown in Figure 5.4, show graphically that sufficiently different tastes in the two nations could conceivably neutralize the difference in their factor endowments and lead to equal relative commodity prices in the two nations in the absence of trade.

5. Starting with the production frontiers for Nation 1 and Nation 2 shown in Figure 5.4, show that with an even greater difference in tastes in the two nations, Nation 1 could end up exporting the capital-intensive commodity.

6. A difference in factor endowments will cause the production frontiers of two nations to be shaped differently.

(a) What else could cause their production frontiers to have different shapes?

(b) What assumption made by Heckscher and Ohlin prevented this in the Heckscher–Ohlin model?

(c) What are other possible causes of a difference in relative commodity prices between the two nations in the absence of trade?

***7.** Draw a figure similar to Figure 5.4 but showing that the Heckscher–Ohlin model holds, even with some difference in tastes between Nation 1 and Nation 2.

8. If you have traveled to poor developing countries, you will have noticed that people there consume very different goods and services than U.S. consumers. Does this mean that tastes in developing countries are very different from U.S. tastes? Explain.

9. Starting from the pretrade equilibrium point in Figure 5.4, assume that tastes in Nation 1 change in favor of the commodity of its comparative *disadvantage* (i.e., in favor of commodity Y).

(a) What is the effect of this change in tastes on P_X/P_Y in Nation 1? How did you reach such a conclusion?

(b) What is the effect of this change in tastes on r/w in Nation 1?

(c) What is the effect of this on the volume of trade and on the trade partner?

10. Comment on the following quotation: “The assumptions necessary to bring about complete equality in the returns to homogeneous factors among nations are so restrictive and unrepresentative of actual reality that the theory can be said to prove the opposite of what it seems to say—namely, that there is no chance whatsoever that factor prices will ever be equalized by free commodity trade.”

11. In what way can international trade be said to have contributed to increased wage inequalities in the United States during the past 20 years?

12. **(a)** Discuss the meaning and importance of the Leontief paradox.

(b) Summarize the empirical results of Kravis, Keesing, Kenen, and Baldwin on the importance of human capital in helping to resolve the paradox.

(c) How was the paradox seemingly resolved by Leamer, Stern, Maskus, and Salvatore and Barazesh?

(d) What is the status of the controversy today?

***13.** **(a)** Draw a figure similar to Figure 5.1 showing factor-intensity reversal.

(b) With reference to your figure, explain how factor reversal could take place.

(c) Summarize the empirical results of Minhas, Leontief, and Ball on the prevalence of factor reversal in the real world.

14. Explain why, with factor-intensity reversal, international differences in the price of capital can decrease, increase, or remain unchanged with international trade.

15. **(a)** Explain how more recent research tried to verify the H–O model.

(b) Explain the results of these more recent empirical tests.

(c) What general conclusion can be reached with respect to the utility and acceptance of the H–O model?

*= Answer provided at www.wiley.com/college/salvatore.

APPENDIX

This appendix presents the formal proof of the factor–price equalization theorem and examines factor-intensity reversal. Section A5.1 repeats (with some modifications to fit our present aim) the Edgeworth box diagrams of Nation 1 and Nation 2 from Figures 3.9 and 3.10. Section A5.2 then examines how international trade brings about equality in *relative* factor prices in the two nations. Section A5.3 shows that *absolute* factor prices are also equalized across nations as a result of international trade. Section A5.4 examines the effect of trade on the short-run distribution of income with the specific-factors model.

Sections A5.5 to A5.7 then feature factor-intensity reversal, utilizing the more advanced analytical tools reviewed in the appendix to Chapter 3. Section A5.5 gives a diagrammatic presentation of factor-intensity reversal. Section A5.6 presents the formula to measure the elasticity of substitution of L for K in production and examines its relationship to factor-intensity reversal. Section A5.7 discusses the method used to conduct empirical tests to determine the prevalence of factor-intensity reversal in the real world.

A5.1 The Edgeworth Box Diagram for Nation 1 and Nation 2

Figure 5.7 shows the Edgeworth box diagram of Nation 2 superimposed on the box diagram of Nation 1 in such a way that their origins for commodity X coincide. The origins for commodity Y differ because Nation 1 has a relative abundance of labor, whereas Nation 2 has a relative abundance of capital. The box diagrams are superimposed on each other to facilitate the analysis to follow.

Because both nations use the same *technology*, the isoquants for commodity X in the two nations are identical (and are measured from the common origin O_X). Similarly, the isoquants for commodity Y in the two nations are also identical (but are measured from origin O_Y for Nation 1 and from origin $O_{Y'}$ for Nation 2). X-isoquants farther from O_X refer to progressively higher outputs of X, while Y-isoquants farther from O_Y or $O_{Y'}$ refer to greater outputs of Y.

By joining all points where an X-isoquant is tangent to a Y-isoquant in each nation, we obtain the nation's production contract curve. Points A, F, and B on Nation 1's production contract curve in Figure 5.7 refer to corresponding points on Nation 1's production frontier (see Figure 3.9). Similarly, points A', F', and B' on Nation 2's production contract curve refer to corresponding points on Nation 2's production frontier. Note that the contract curves of both nations bulge toward the lower right-hand corner because commodity X is the L-intensive commodity in both nations.

A5.2 Relative Factor–Price Equalization

Figure 5.8 repeats Figure 5.7 but omits (to keep the figure simple) all isoquants as well as points F and F' (which are not needed in the subsequent analysis). The no-trade equilibrium point is A in Nation 1 and A' in Nation 2 (as in Figures 3.3 and 3.4). The K/L ratio in the production of commodity X is smaller in Nation 1 than in Nation 2. This is given by the lesser slope of the line (not shown) from origin O_X to point A as opposed to point A'. Similarly, the K/L ratio in the production of commodity Y is also smaller in Nation 1 than

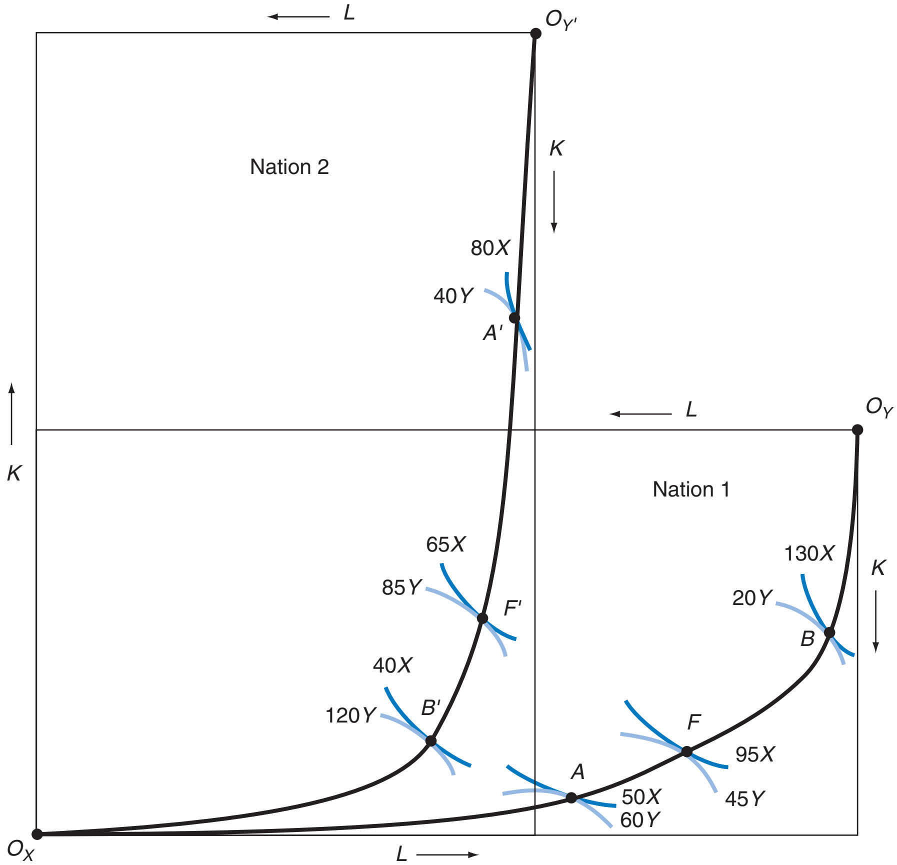


FIGURE 5.7. The Edgeworth Box Diagram for Nation 1 and Nation 2—Once Again.
The Edgeworth box diagram of Nation 2 from Figure 3.10 is superimposed on the box diagram for Nation 1 from Figure 3.9 in such a way that their origins for commodity X coincide. Because both nations use the same technology, the isoquants of commodity X are identical in the two nations. The same is true for the Y-isoquants. The points on each nation's production contract curve refer to corresponding points on the nation's production frontier. The contract curves of both nations bulge toward the lower right-hand corner because commodity X is the *L*-intensive commodity in both nations.

in Nation 2. This is given by the smaller slope of the line (not shown) from O_Y to point A as opposed to the slope of the line (also not shown) from $O_{Y'}$ to point A'.

Since Nation 1 uses a smaller amount of capital per unit of labor (K/L) in the production of both commodities with respect to Nation 2, the productivity of labor and therefore the wage rate (w) are lower, while the productivity of capital and therefore the rate of interest (r) are higher, in Nation 1 than in Nation 2. This is always the case when both nations use a production function that is homogeneous of degree one, showing constant returns to scale (as assumed throughout).

With a lower w and a higher r, w/r is lower in Nation 1 than in Nation 2. This is consistent with the relative physical abundance of labor in Nation 1 and capital in Nation 2. The lower w/r in Nation 1 at autarky point A is reflected in the smaller (absolute) slope

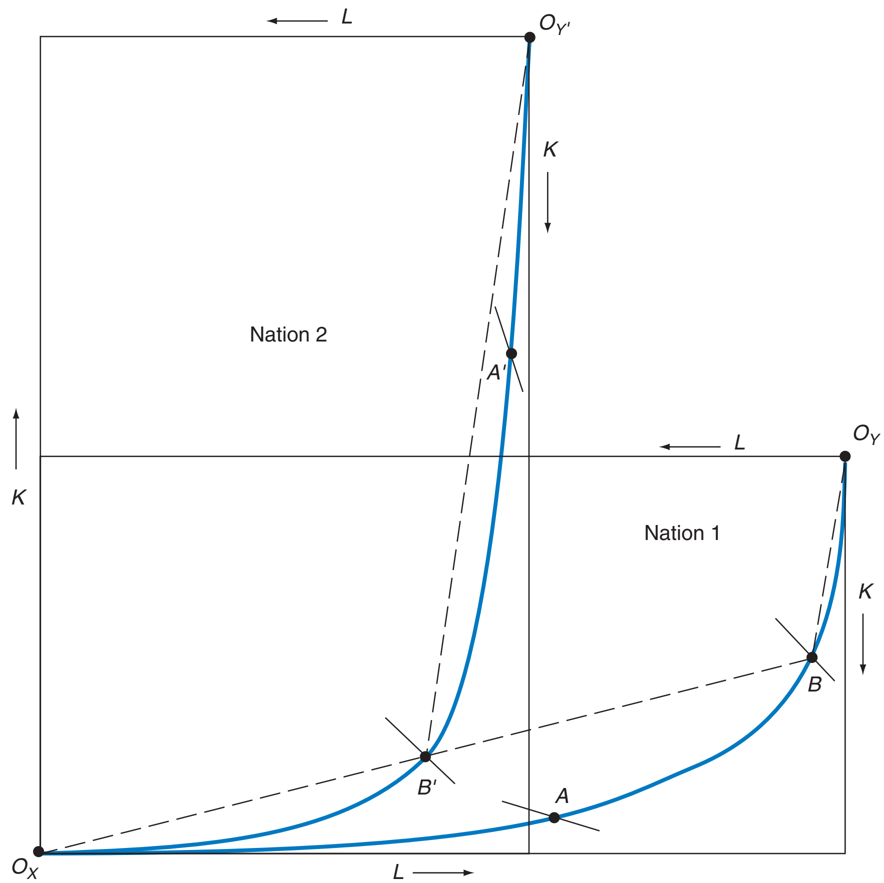


FIGURE 5.8. Formal Proof of the Factor–Price Equalization Theorem.
At the no-trade equilibrium point A in Nation 1 and A' in Nation 2, K/L is lower in the production of both commodities in Nation 1 than in Nation 2. These are given by the lower slopes of straight lines (not shown) from O_X and O_Y or $O_{Y'}$ to points A and A'. Since w/r (the absolute slope of the solid line through point A) is lower in Nation 1 and commodity X is L intensive, Nation 1 specializes in the production of commodity X until it reaches point B. Nation 2 specializes in Y until it reaches point B'. At B and B', K/L and therefore w/r are the same in both nations.

of the (short and solid) straight line through point A as opposed to the corresponding line at point A'. (The straight lines are the common tangents to the X- and Y-isoquants—not shown in Figure 5.8—at point A and point A'.)

To summarize, we can say that at the no-trade equilibrium point A, Nation 1 uses a smaller K/L ratio in the production of both commodities with respect to Nation 2. This results in lower productivity of labor and higher productivity of capital in Nation 1 than in Nation 2. As a result, w/r is lower in Nation 1 (the L-abundant nation) than in Nation 2.

Since Nation 1 is the L-abundant nation and commodity X is the L-intensive commodity, with the opening of trade Nation 1 will specialize in the production of commodity X (i.e., will move from point A toward O_Y along its production contract curve). Similarly, Nation 2 will specialize in the production of commodity Y and move from point A' toward O_X.

Specialization in production continues until Nation 1 reaches point B and Nation 2 reaches point B', where K/L is the same in each commodity in both nations. This is given by the slope of the dashed line from O_X through points B' and B for commodity X, and by the parallel dashed lines from O_Y and $O_{Y'}$ to points B and B' for commodity Y, for Nation 1 and Nation 2, respectively.

Note that as Nation 1 moves from point A to point B, K/L rises in the production of both commodities. This is reflected by the steeper slope of the dashed lines from O_X and O_Y to point B as opposed to point A. As a result of this increase in K/L, the productivity and therefore the wage of labor rise in Nation 1 (the low-wage nation). On the other hand, as Nation 2 moves from point A' to B', K/L falls in the production of both commodities. This is reflected by the smaller slope of the dashed lines from $O_{Y'}$ and O_X to point B' as opposed to point A'. As a result of this decline in K/L, the productivity and therefore the wage of labor falls in Nation 2 (the high-wage nation). The exact opposite is true for capital.

In the absence of trade, w/r was lower in Nation 1 than in Nation 2 (see the absolute slopes of the solid straight lines through points A and A'). As Nation 1 (the low-wage nation) specializes in the production of commodity X, K/L and w/r rise in the production of both commodities in Nation 1. As Nation 2 (the high-wage nation) specializes in the production of commodity Y, K/L and w/r fall in the production of both commodities. Specialization in production continues until K/L and w/r have become equal in the two nations. This occurs when Nation 1 produces at point B and Nation 2 produces at point B' with trade. This concludes our formal proof that international trade equalizes relative factor prices in the two nations when all the assumptions listed in Section 5.2A hold.

Problem Show graphically that with sufficiently less capital available, Nation 1 would have become completely specialized in the production of commodity X before relative factor prices became equal in the two nations.

A5.3 Absolute Factor–Price Equalization

This proof of absolute factor-price equalization is more difficult than the proof of relative factor-price equalization and is seldom if ever covered in undergraduate courses, even when all students in the course have had intermediate microeconomics and macroeconomics. The proof is included here only for the sake of completeness and for more advanced undergraduate students and first-year graduate students.

The proof makes use of Euler's theorem. According to Euler's theorem, if constant returns to scale prevail in production and if each factor is rewarded (paid) according to its productivity, the output produced is exhausted and just exhausted. Specifically, the marginal physical product of labor *(MPL)* times the amount of labor used in production *(L)* plus the marginal physical product of capital *(MPK)* times the amount of capital used in production *(K)* exactly equals the output produced. The same is true for commodity Y. In equation form, Euler's theorem in the production of commodity X can be expressed as

$$(MPL)(L) + (MPK)(K) = X \tag{5A-1}$$

Dividing both sides by L and rearranging:

$$X/L = MPL + (MPK)(K)/L \tag{5A-2}$$

Factoring out *MPL*:

$$X/L = MPL[(1 + K/L)(MPK/MPL)] \tag{5A-3}$$

With trade, Nation 1 produces at point B and Nation 2 produces at point B' in Figure 5.8. Since at points B and B', w/r is the same in both nations, *MPK/MPL* is also the same in both nations. We also know that at points B and B', K/L in the production of commodity X is the same in both nations. Finally, X/L is the average product of labor in the production of commodity X—and this is also the same in the two nations because of the assumptions of constant returns to scale and the same technology. As a result, the last remaining component (*MPL*) in Equation (5A-3) must also be the same in the production of commodity X *in both nations* if Equation (5A-3) is to hold.

Since the real wage is equal to *MPL*, the equality of *MPL* in the two nations means that real wages are the same in the two nations in the production of commodity X. With perfect competition and perfect internal factor mobility, real wages in the production of commodity Y are equal to real wages in the production of commodity X in each nation as well. In a completely analogous way, we can prove that the rate of interest is the same in the two nations in the production of both commodities. This concludes our proof that international trade equalizes absolute factor prices in the production of both commodities in both nations (under highly restrictive assumptions). That is, we have proved that real wages (w) are the same in both nations in the production of both commodities. Similarly, the real rate of interest (r) is also the same in both nations in the production of both commodities.

A5.4 Effect of Trade on the Short-Run Distribution of Income: The Specific-Factors Model

Suppose that in Nation 1 (the *L*-abundant nation) labor is mobile between industries but capital is not. Since labor is mobile, the wage of labor will be the same in the production of commodities X and Y in Nation 1. The equilibrium wage and the amount of labor employed in the production of X and Y in Nation 1 are given by the intersection of the value of the marginal product of labor curve in the production of X and Y. From micro economic theory, we know that the value of the marginal product of labor in the production of X is equal to the price of commodity X times the marginal physical product of labor in the production of X. That is, $VMPL_X = (P_X)(MPL_X)$. Similarly, $VMPL_Y = (P_Y)(MPL_Y)$. We also know that if a firm employs more labor with a given amount of capital, *VMPL* declines because of the law of diminishing returns. Finally, to maximize profits, firms will employ labor until the wage they must pay equals the value of the marginal product of labor (i.e., until $w = VMPL$).

We can show the no-trade equilibrium wage and employment of labor in the production of commodities X and Y in Nation 1 with the aid of Figure 5.9. In the figure, the horizontal axis measures the total supply of labor available to Nation 1, and the vertical axis measures the wage rate. To begin with, concentrate on the $VMPL_X$ curve (which is read from left to right, as usual) and on the $VMPL_Y$ curve (which is read from right to left). The equilibrium wage rate is *ED* and is determined at the intersection of the $VMPL_X$ and $VMPL_Y$ curves. The wage rate is identical in the production of X and Y because of perfect labor mobility in the nation between the two industries. The amount *OD* of labor is used in the production of X, and the remainder, or DO', is used in the production of Y.

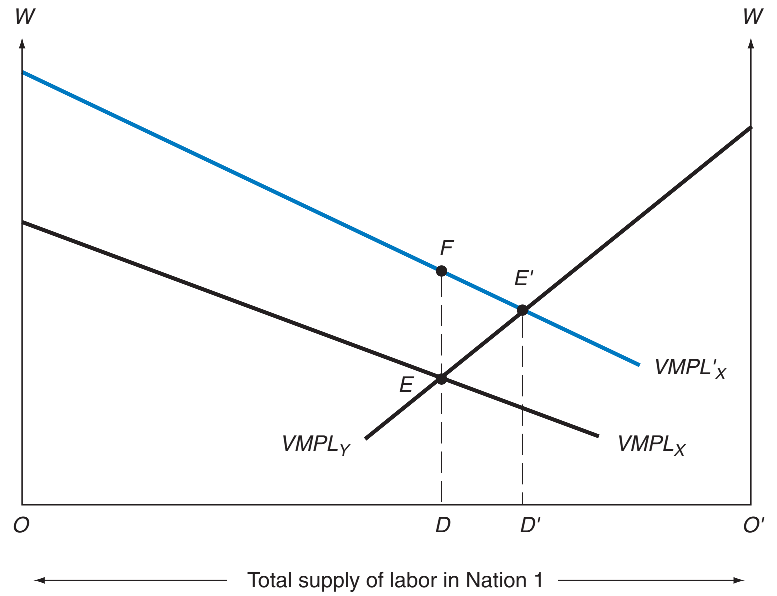


FIGURE 5.9. Specific-Factors Model.
Labor is mobile between industries, but capital is not. The horizontal axis measures the total supply of L available to Nation 1, and the vertical axis the wage rate (w). Before trade, the intersection of the $VMPL_X$ and $VMPL_Y$ curves determines $w = ED$ in the two industries. OD of L is used in the production of X and DO' in Y. With trade, P_X/P_Y increases and shifts $VMPL_X$ up to $VMPL_X{}'$, w rises from ED to $E'D'$, and DD' of L shifts from Y to X. Since w rises less than P_X, w falls in terms of X but rises in terms of Y (since P_Y is unchanged). With more L used with fixed K in the production of X, $VMPK_X$ and r increase in terms of both X and Y. With less L used with fixed K in Y, $VMPK_Y$ and r fall in terms of both commodities.

Since Nation 1 (the L-abundant nation) has a comparative advantage in commodity X (the L-intensive commodity), the opening of trade increases P_X/P_Y. Since $VMPL_X = (P_X)(MPL_X)$, the increase in P_X shifts the $VMPL_X$ curve upward proportionately, by EF, to $VMPL_X{}'$. The wage rate increases less than proportionately, from ED to $E'D'$, and DD' units of labor shift from the production of Y to the production of X. Since w increases by less than the increase in P_X, w falls in terms of X but rises in terms of Y (since P_Y is unchanged). Thus, the effect of the increase in P_X on the real income of labor is ambiguous and depends on spending patterns. Workers who consume mainly commodity X will be worse off, while those who consume mainly commodity Y will be better off.

The rewards *(r)* to the specific factor (capital) change unambiguously, however. Since the specific capital in the production of commodity X has more labor to work with, $VMPK_X$ and r increase in terms of both commodities X and Y. On the other hand, since less labor is used with the fixed capital in the production of commodity Y, $VMPK_Y$ and r fall in terms of commodity X, and therefore in terms of commodity Y as well.

Thus, with the opening of trade, the real income of the immobile capital (the nation's scare factor) rises in the production of X and falls in the production of Y, whereas real wages (which are equal in the production of both commodities) fall in terms of commodity X and rise in terms of commodity Y. This is the result we obtain in the short run with the specific-factors model when capital is specific to or immobile between the two industries of the nation.

Generalizing the specific-factors model, we can say that *trade will have an ambiguous effect on each nation's mobile factors, benefit the immobile factors specific to the nation's export sectors, and harm the immobile factors specific to the nation's import-competing sectors*. This is what we can expect in the short run when some factors are specific or immobile (i.e., can only be used in some industries). In the long run, of course, when all inputs are mobile among all industries of a nation, the Heckscher–Ohlin model postulates that the opening of trade will lead to an increase in the real income or return of the inputs used intensively in the nation's export sectors and to a reduction in the real income or return of the inputs used intensively in the production of the nation's import-competing sectors.

Problem What effect will the opening of trade have on the real income of labor and capital in Nation 2 (the K-abundant nation) if L is mobile between the two industries in Nation 2 but K is not?

A5.5 Illustration of Factor-Intensity Reversal

Figure 5.10 shows a single isoquant for commodity X and a single isoquant for commodity Y. From Section A3.1, we know that with a homogeneous production function of degree one, a single isoquant completely describes the entire production function of each

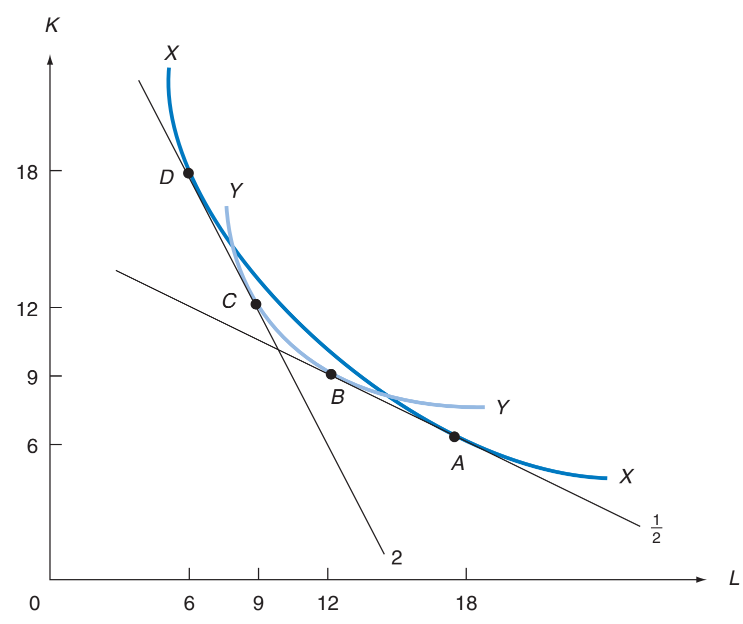


FIGURE 5.10. Factor-Intensity Reversal.
At $w/r = 1/2$, commodity X is produced at point *A* with $K/L = 6/18 = 1/3$, while commodity Y is produced at point *B* with $K/L = 9/12 = 3/4$. Thus, commodity X is the *L*-intensive commodity. On the other hand, at $w/r = 2$, commodity Y is produced at point *C* with $K/L = 12/9 = 4/3$, while commodity X is produced at point *D* with $K/L = 18/6 = 1/3 = 3$. Thus, commodity X is *L* intensive at $w/r = 1/2$ and *K* intensive at $w/r = 2$ in relation to commodity Y, and factor-intensity reversal is present.

commodity. Furthermore, since both nations are assumed to use the same technology, we can use the single X- and Y-isoquants to refer to both nations.

Figure 5.10 shows that at $w/r = 1/2$, commodity X is produced at point A, where the X-isoquant is tangent to the isocost line with slope (w/r) equal to $1/2$ and $K/L = 6/18 = 1/3$. Commodity Y is produced at point B, where the Y-isoquant is tangent to the same isocost line with slope (w/r) equal to $1/2$ and $K/L = 9/12 = 3/4$. Thus, at $w/r = 1/2, K/L$ is higher for commodity Y, so that commodity X is the relatively L-intensive commodity.

On the other hand, at $w/r = 2$, commodity Y is produced at point C, where the Y-isoquant is tangent to the isocost line with slope (w/r) equal to 2 and $K/L = 12/9 = 4/3$. Commodity X is produced at point D, where the X-isoquant is tangent to the same isocost line with slope (w/r) equal to 2 and $K/L = 18/6 = 3$. Thus, at $w/r = 2$, commodity X is the relatively K-intensive commodity.

As a result, commodity X is L intensive at $w/r = 1/2$ and K intensive at $w/r = 2$ with respect to commodity Y, and we say that factor-intensity reversal is present.

With factor-intensity reversal, both the H–O theorem and the factor-price equalization theorem must be rejected. To see this, suppose that Nation 1 is the relatively L-abundant nation with $w/r = 1/2$, while Nation 2 is the relatively K-abundant nation with $w/r = 2$. With $w/r = 1/2$, Nation 1 should specialize in the production of and export commodity X because Nation 1 is the L-abundant nation and commodity X is the L-intensive commodity there. With $w/r = 2$, Nation 2 should specialize in the production of and export commodity X because Nation 2 is the K-abundant nation and commodity X is the K-intensive commodity there. Since both nations cannot export to each other the same *homogeneous* commodity (i.e., commodity X), the H–O theorem no longer predicts the pattern of trade.

When the H–O model does not hold, the factor–price equalization theorem also fails. To see this, note that as Nation 1 (the low-wage nation) specializes in the production of commodity X (the L-intensive commodity), the demand for labor rises, and w/r and w rise in Nation 1. With Nation 1 specializing in and exporting commodity X to Nation 2, Nation 2 must specialize in and export commodity Y to Nation 1 (since the two nations could not possibly export the same homogeneous commodity to each other). However, since commodity Y is the L-intensive commodity in Nation 2, the demand for labor rises, and w/r and w rise in Nation 2 (the high-wage nation) also. Thus, wages rise both in Nation 1 (the low-wage nation) and in Nation 2 (the high-wage nation).

If wages rise faster in Nation 1 than in Nation 2, the difference in wages between the two nations declines, as predicted by the factor–price equalization theorem. If wages rise more slowly in Nation 1 than in Nation 2, the wage difference increases. If wages rise by the same amount in both nations, the wage difference remains unchanged. Since there is no a priori way to determine the effect of international trade on the difference in factor prices in each case, we must reject the factor–price equalization theorem.

From Figure 5.10, we can see that factor-intensity reversal arises because the X-isoquant has a much smaller curvature than the Y-isoquant and the X- and Y-isoquants *cross twice within the two relative factor price lines*. When the two isoquants have similar curvature, they will only cross once and there is no factor-intensity reversal.

Problem Draw a figure similar to Figure 5.10 with the X-isoquant and the Y-isoquant crossing only once within the relative factor price lines of the two nations and show that in that case there is no factor-intensity reversal.

A5.6 The Elasticity of Substitution and Factor-Intensity Reversal

We have said that for factor-intensity reversal to occur, the X-isoquant and the Y-isoquant must have sufficiently *different* curvatures to cross twice within the relative factor price lines prevailing in the two nations. The curvature of an isoquant measures the ease with which L can be substituted for K in production as the relative price of labor (i.e., w/r) declines. When w/r falls, producers will want to substitute L for K in the production of both commodities to minimize their costs of production.

The flatter (i.e., the smaller the curvature of) an isoquant, the easier it is to substitute L for K (and vice versa) in production. A measure of the curvature of an isoquant and the ease with which one factor can be substituted for another in production is given by the elasticity of substitution. The elasticity of substitution of L for K in production (e) is measured by the following formula:

$$e = \frac{\Delta(K/L)/(K/L)}{\Delta(\text{slope})/(\text{slope})}$$

For example, the elasticity of substitution of L for K for commodity X between point D and point A is calculated as follows. $K/L = 3$ at point D and $K/L = 1/3$ at point A in Figure 5.10. Therefore, the change in K/L for a movement from point D to point A along the X-isoquant is $3 - 1/3 = 2\,2/3 = 8/3$. Thus, $\Delta(K/L)/(K/L) = (8/3)/3 = 8/9$. The absolute slope of the X-isoquant is 2 at point D and $1/2$ at point A. Therefore, $\Delta(\text{slope}) = 2 - 1/2 = 1\,1/2 = 3/2$. Thus, $\Delta(\text{slope})/(\text{slope}) = (3/2)/2 = 3/4$. Substituting these values into the formula, we get

$$e = \frac{\Delta(K/L)/(K/L)}{\Delta(\text{slope})/(\text{slope})} = \frac{8/9}{3/4} = 32/27 = 1.19$$

Similarly, the elasticity of substitution of L and K between point C and point B along the Y-isoquant is

$$e = \frac{\Delta(K/L)/(K/L)}{\Delta(\text{slope})/(\text{slope})} = \frac{[(4/3) - 3/4)]/(4/3)}{(2 - 1/2)/(2)}$$

$$= \frac{(7/12)/(4/3)}{(1\,1/2)/2} = \frac{21/48}{3/4} = 84/144 = 0.58$$

Thus, the X-isoquant has a much smaller curvature and a much greater elasticity of substitution than the Y-isoquant. It is this difference in curvature and elasticity of substitution between the X-isoquant and the Y-isoquant that results in their crossing twice within the relative factor price lines, giving factor-intensity reversal. Note that a difference in the curvature of the isoquants and in the elasticity of substitution is a necessary but not sufficient condition for factor-intensity reversal. For factor-intensity reversal to occur, the elasticity of substitution must be sufficiently different so that the isoquants of the two commodities cross *within* the relative factor price lines of the two nations.

Problem Calculate the elasticity of substitution of L and K for the X-isoquant and Y-isoquant of the previous problem (where there is no factor-intensity reversal), and verify that the elasticity of substitution for the two isoquants does not differ much because of their similar curvature. Assume that the coordinates are A (4,2), B (3,3), C (3,2.5), D (2,4), and that the absolute slope of the isoquants is 1 at points A and C and 2 at B and D.

A5.7 Empirical Tests of Factor-Intensity Reversal

Until 1961, economists used almost exclusively the Cobb–Douglas production function in their work. This implied that the elasticity of substitution of L for K was equal to 1 in the production of all commodities. As a result, this production function was not at all useful to measure the prevalence of factor-intensity reversal in the real world.

Partially in response to the need to measure factor-intensity reversal in international trade, a new production function was developed in 1961 by *Arrow, Chenery, Minhas, and Solow*, called the constant elasticity of substitution (CES) production function. As its name implies, the CES production function kept the elasticity of substitution of L for K constant for each industry but allowed the elasticity of substitution to vary from industry to industry.

It was this CES production function that Minhas used to measure factor-intensity reversal. That is, Minhas found that the elasticity of substitution of L and K differed widely in the six industries that he studied and that factor-intensity reversal occurred in one-third of the cases. This rate of occurrence is too frequent for factor reversal to be treated as an exception; if true, it would have seriously damaged the H–O model.

However, *Leontief* calculated the elasticity of substitution of all 21 industries used to derive the CES production function (rather than just the six selected by Minhas) and found that factor reversal occurred in only 8 percent of the cases. Furthermore, when he removed two industries intensive in natural resources, factor reversal fell to about 1 percent of the cases. Thus, Leontief concluded that factor-intensity reversal is a rather rare occurrence and that the H–O model should not be rejected on account of these exceptions.

Minhas also conducted another test in his study. He calculated K/L for the same 20 industries in the United States and Japan, ranked these industries according to the K/L in each nation, and then found the coefficient of rank correlation between the industry rankings in the two nations. Since the United States was the relatively K-abundant nation, all industries could be expected to be more K intensive in the United States than in Japan. However, the K-intensity *ranking* of the industries would have to be very similar in the United States and Japan in order for factor-intensity reversal to be rare. That is, the most K-intensive industries in the United States should also be the most K-intensive industries in Japan. Minhas found that the rank correlation was only 0.34 and concluded that factor reversal was fairly common.

However, *Ball* found that when agriculture and two industries intensive in natural resources were removed from the list, the rank correlation rose to 0.77, so that, once again, the conclusion could be reached that factor-intensity reversal is not a common occurrence.

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A great deal of trade statistics for the United States by country and region can be found through the home page of the U.S. Department of Commerce, International Trade Administration, at:

http://www.trade.gov/mas/ian/

Trade statistics for European countries are provided by EuroStat (the Statistical Office of the European Communities) at:

http://ec.europa.eu/trade/statistics

A wealth of detailed international trade statistics by country, industry, and year for 175 countries and areas is also provided in *International Trade Statistics Yearbook*, Vol. 1, published by the United Nations at:

http://comtrade.un.org/pb/

The IMF publishes the Direction of Trade Statistics (yearly and quarterly) on the volume of trade to and from each of the 187 member countries of the IMF, Click "Direction of Trade Statistics (DOTS)" at:

http://www.imf.org/external/data.htm

The hourly compensation of U.S. workers in manufacturing and how it compares with that of foreign workers is found at:

http://www.bls.gov/data/home.htm#international

The capital stock per worker of many countries is found on the University of Pennsylvania website at:

http://pwt.econ.upenn.edu

chapter

6

Economies of Scale, Imperfect Competition, and International Trade

LEARNING GOALS:

After reading this chapter, you should be able to:

- Explain how international trade can result from economies of scale
- Explain how product differentiation leads to intra-industry trade
- Understand the technological gap and product cycle models of trade
- Understand the relationship between transportation costs and environmental standards on international trade

6.1 Introduction

We have seen in Chapter 5 that the Heckscher–Ohlin theory based comparative advantage on differences in factor endowments among nations. The theory, however, leaves a significant portion of today's international trade unexplained. In this chapter, we fill this gap with some new, complementary trade theories, which base a great deal of international trade flows on economies of scale, imperfect competition, and differences in the development and spread of new technologies over time among nations.

Section 6.2 examines the effect of relaxing each of the assumptions on which the Heckscher–Ohlin theory rests. Section 6.3 examines international trade based on economies of scale. Section 6.4 shows the importance of imperfect competition as the basis of a great deal of today's international trade. Section 6.5 presents models that base international trade on differences in dynamic changes in technology among nations. Finally, Section 6.6 examines the effect of transportation costs and environmental standards on the location of industry and the flow of international trade. The appendix to this chapter examines external economies and their importance for international trade.

6.2 The Heckscher–Ohlin Model and New Trade Theories

In this section we relax the assumptions of the Heckscher–Ohlin theory discussed in Section 5.2. We will see that relaxing the assumptions does not affect the validity of the basic Heckscher–Ohlin model, but points to the need for new, complementary trade theories to explain the significant portion of international trade that the Heckscher–Ohlin theory leaves unexplained.

Relaxing the first assumption (two nations, two commodities, and two factors) to include more than two nations, more than two commodities, and more than two factors, while certainly complicating the analysis, leaves the H–O model basically valid, as long as the number of commodities is equal to or larger than the number of factors. One complication that arises in dealing with more than two factors is that we can no longer classify a commodity simply as L or K intensive but will require the construction of a factor-intensity *index* to predict the pattern of trade. This can be complex but should still be possible.

The second assumption of the Heckscher–Ohlin theory (i.e., that both nations use the same technology in production) is not generally valid. That is, nations often do use different technologies in the real world. However, technology can be regarded as a factor of production, and, as such, trade based on given technological differences among nations could be viewed as falling within the realm of the H–O theory. Trade based on *changes* in technology over time among nations is a different matter, however. These are explained by the technological gap and product cycle models. While these models could be regarded as dynamic extensions of the basic H–O model, they are in fact different and are discussed in Section 6.5.

The third assumption, that commodity X is the L-intensive commodity, while commodity Y is the K-intensive commodity in both nations, implies the absence of factor-intensity reversal. As pointed out in Section 5.6c, factor-intensity reversal would lead to the rejection of the H–O model. Empirical studies, however, indicate that factor-intensity reversal is not very common in the real world. It seems that the Leontief paradox could be eliminated by the inclusion of human capital, the exclusion of commodities intensive in natural resources, and comparing the K/L ratio in production versus consumption rather than in exports versus imports.

While the H–O theory assumed constant returns to scale (assumption 4), international trade can also be based on increasing returns to scale. Increasing returns to scale can be regarded as *complementary* to the H–O theory in that they try to explain a portion of international trade not covered by the basic H–O theory. Economies of scale as a basis for trade are examined in Section 6.3.

The fifth assumption of the H–O model was incomplete specialization in both nations. If trade brings about complete specialization in production in one of the nations, relative commodity prices will be equalized, but factor prices will not. For example, if in Figure 5.8 the amount of capital available to Nation 1 is so much less that point B (at which factor prices would be equalized in the two nations) is outside the Edgeworth box for Nation 1 (and therefore unattainable), factor prices will not be equalized in the two nations, even though relative commodity prices are.

Assumption 6 on equal tastes has been more or less verified empirically. Tastes are certainly not sufficiently different across nations to overcome differences in the relative *physical* availability of factors of production in explaining different relative commodity prices and trade among nations.

Relaxing assumption 7 of perfect competition in all product and factor markets is more troublesome. It seems that a significant portion of trade in manufactured goods among industrialized nations is based on product differentiation and economies of scale, which (at first sight at least) does not seem easily reconcilable with the H–O factor-endowment model. Such intra-industry trade is examined in Section 6.4.

Relaxing assumption 8 of no international factor mobility modifies but does not invalidate the H–O model. As pointed out in Section 5.5A, international factor mobility can be a substitute for international trade in bringing about equality of relative commodity and factor prices among nations. With some, but less than perfect, international factor mobility, the volume of trade required to bring about relative commodity and factor–price equalization would be less. This modifies the basic H–O model but does not take away its validity.

Similarly, costs of transportation and other nonprohibitive obstructions to the flow of international trade (assumption 9) reduce the volume and the benefits of international trade, but they only modify (rather than lead to the rejection of) the H–O theorem and the factor-equalization theorem. Costs of transportation and environmental standards are discussed in Section 6.6.

With resources not fully utilized (i.e., relaxing assumption 10), a potential comparative advantage based on unutilized or underutilized resources might not show through or emerge. The H–O theory would then incorrectly predict the pattern of trade. However, aside from temporary economic recessions and frictional unemployment (i.e., unemployment arising in the process of changing jobs), the full employment assumption is for the most part satisfied, at least in industrial countries.

Relaxing assumption 11, that international trade among nations is balanced, could lead a nation with a trade deficit to import some commodities in which it would have a comparative advantage and it would in fact export with balanced trade. Since most trade imbalances are generally not very large in relation to GNP, the charge that the H–O model might be unable to correctly predict the pattern of trade is true only for those commodities in which the nation has only a very small comparative advantage.

In conclusion, relaxing most of the assumptions of the Heckscher–Ohlin theory only modifies but does not invalidate the theory. Relaxing the assumptions of constant economies of scale and perfect competition, however, requires new, complementary trade theories to explain the significant portion of international trade that the H–O theory leaves unexplained. International trade based on differences in technological changes over time among nations also calls for new trade theories. We now turn to these new, complementary trade theories.

6.3 Economies of Scale and International Trade

One of the assumptions of the H–O model was that both commodities were produced under conditions of constant returns to scale in the two nations (assumption 4 in Section 5.2). With increasing returns to scale, mutually beneficial trade can take place even when the two nations are identical in every respect. This is a type of trade that the H–O model does not explain.

Increasing returns to scale refers to the production situation where output grows proportionately more than the increase in inputs or factors of production. That is, if all inputs are doubled, output is more than doubled. If all inputs are tripled, output is more than tripled.

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Increasing returns to scale may occur because at a larger scale of operation a greater division of labor and specialization becomes possible. That is, each worker can specialize in performing a simple repetitive task with a resulting increase in productivity. Furthermore, a larger scale of operation may permit the introduction of more specialized and productive machinery than would be feasible at a smaller scale of operation. *Antweiler and Trefler* (2002) found that a third of all goods-producing industries are characterized by increasing returns to scale.

Figure 6.1 shows how mutually beneficial trade can be based on increasing returns to scale. If the two nations are assumed to be identical in every respect, we can use a single production frontier and a single indifference map to refer to both nations. Increasing returns to scale result in production frontiers that are *convex* from the origin, or inward-bending. With identical production frontiers and indifference maps, the no-trade equilibrium relative commodity prices in the two nations are also identical. In Figure 6.1, this is $P_X/P_Y = P_A$ in both nations and is given by the slope of the common tangent to the production frontier and indifference curve I at point A.

With trade, Nation 1 could specialize completely in the production of commodity X and produce at point B. Nation 2 would then specialize completely in the production of commodity Y and produce at point B'. By then exchanging 60X for 60Y with each other, each nation would end up consuming at point E on indifference curve II, thus gaining 20X and 20Y. These gains from trade arise from economies of scale in the production of only one commodity in each nation. In the absence of trade, the two nations would not specialize in the production of only one commodity because each nation wants to consume both commodities.

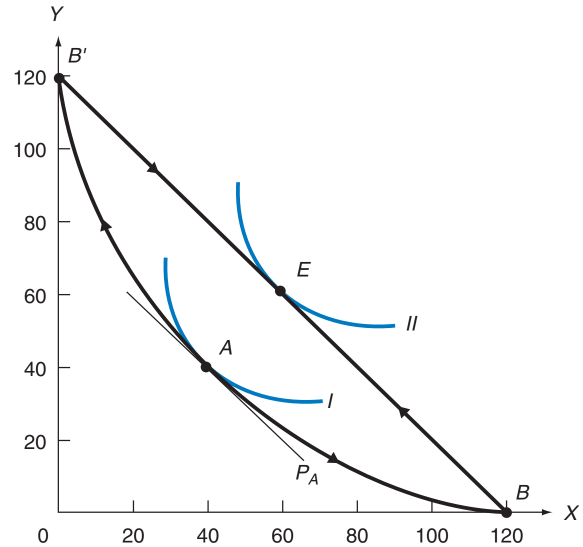

FIGURE 6.1. Trade Based on Economies of Scale.
With identical and convex to the origin (because of economies of scale) production frontiers and indifference maps, the no-trade equilibrium-relative commodity price in the two nations is identical and given by P_A. With trade, Nation 1 could specialize completely in the production of commodity X and produce at point B. Nation 2 would then specialize completely in the production of commodity Y and produce at point B'. By then exchanging 60X for 60Y with each other, each nation would end up consuming at point E on indifference curve II, thus gaining 20X and 20Y.

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Note that the no-trade equilibrium point A is unstable in the sense that if, for whatever reason, Nation 1 moves to the right of point A along its production frontier, the relative price of X (the slope of the production frontier) will fall and will continue to fall until Nation 1 becomes completely specialized in the production of commodity X. Similarly, if Nation 2 moves to the left of point A along its production frontier, P_X/P_Y will rise (so that its inverse, P_Y/P_X, falls) until Nation 2 becomes completely specialized in the production of commodity Y.

Several additional aspects of the preceding analysis and Figure 6.1 must be clarified. First of all, it is a matter of complete indifference which of the two nations specializes in the production of commodity X or commodity Y. In the real world, this may result from historical accident. Second, it should be clear, at least intuitively, that the two nations need not be identical in every respect for mutually beneficial trade to result from increasing returns to scale. Third, if economies of scale persist over a sufficiently long range of outputs, one or a few firms in the nation will capture the entire market for a given product, leading to monopoly (a single producer of a commodity for which there is no close substitute) or oligopoly (a few producers of a homogeneous or differentiated product).

Fourth, since the early 1980s, there has been a sharp increase in international trade in parts and components through outsourcing and offshoring, and these are the source of new and significant international economies of scale. Outsourcing refers to the purchase by a firm of parts and components abroad in order to keep its costs down. Offshoring refers, instead, to a firm producing in its own plants abroad some of the parts and components that it uses in its products. While outsourcing and offshoring lead to international economies of scale (see Case Study 6-1), they also lead to complaints that a significant number of high-paying jobs are transferred abroad (see Case Study 6-2).

CASE STUDY 6-1 The New International Economies of Scale

Today, more and more products manufactured by international corporations have parts and components made in many different nations (see Case Study 1-1). The reason is to minimize production costs. For example, the motors of some Ford Fiestas are produced in the United Kingdom, the transmissions in France, the clutches in Spain, and the parts are assembled in Germany for sales throughout Europe. Similarly, Japanese and German cameras are often assembled in Singapore to take advantage of cheaper labor there.

Foreign "sourcing" of inputs is often not a matter of choice to earn higher profits, but simply a requirement to remain competitive. Firms that do not look abroad for cheaper inputs face loss of competitiveness in world markets and even in the domestic market. U.S. firms now spend more than \$100 billion on outsourcing, and by doing so they cut costs by 10 to 15 percent. Outsourcing now accounts for more than one-third of total manufacturing costs by Japanese firms, and this saves them more than 20 percent of production costs.

Firms must constantly explore sources of cheaper inputs and overseas production in order to remain competitive in our rapidly shrinking world. Indeed, this process can be regarded as manufacturing's *new international economies of scale* in today's global economy. Just as companies were forced to rationalize operations within each country in the 1980s, they now face the challenge of integrating their operations for their entire system of manufacturing around the world in order to take advantage of these new international economies of scale. What is important is for the firm to focus on its core competency (i.e., in the production of) those components that are indispensable to the company's competitive position over subsequent product generations and outsource

(continued)

CASE STUDY 6-1 Continued

other components in which outside suppliers have a distinctive production advantage. These new international economies of scale are likely to become even more important in the future as we move closer and closer to a truly global economy.

Sources: "Manufacturing's New Economies of Scale," *Harvard Business Review*, May–June 1992, pp. 94–102; "How to Think Strategically about Outsourcing," *Harvard Management Update*, May 2000, pp. 4–6; and D. Salvatore, "The U.S. Challenge to European Firms," *European Journal of International Management*, Vol. 1, No. 1, 2007, pp. 69–80.

CASE STUDY 6-2 Job Loss Rates in U.S. Industries and Globalization

Table 6.1 shows that, from 2003 to 2005, the percentage of jobs lost in U.S. manufacturing was three times higher than in U.S. service industries, but in all sectors (except professional and business services) job losses were much higher in the nontradable than in the tradable sectors (and thus not caused by increased imports, outsourcing, or offshoring). As discussed in Case Study 3-4, most *direct* job losses in the United States resulted from technological changes that raised labor productivity rather than from international trade itself, and it affected mostly low-skilled industrial workers. As debated by *Samuelson* (2004), *Bhagwati* (2007), *Blinder* (2008), *Coe* (2008), *Summers* (2008), and *Harrison and McMillan* (2011), the fear now is that the revolution in telecommunications and transportation is making possible the export of an increasing number of high-skill and high-paying jobs, not only in manufacturing but also in a growing range of services that until recently were regarded as secure. In fact, *Barefoot and Mataloni* (2011) found that from 1999 to 2009 U.S. multinational corporations cut their workforce in the United States by nearly 900,000 while at the same time expanding it by 2.9 million workers abroad.

TABLE 6.1. U.S. Job Loss Rates by Industry (Percent)

Industry	Overall	Tradable	Nontradable
Manufacturing	12	12	17
Information	4	4	15
Financial Services	4	3	12
Professional & Business Services	4	6	3

Source: A. Bradword and L. G. Kletzer "Fear of Offshoring: The Scope and Potential Impact of Imports and Exports of Services," *Policy Brief*, Petersen Institute, January 2008.

Economies of scale or increasing returns to scale must also be clearly distinguished from external economies. The former refer to the reduction in the average costs of production as *the firm's output expands*. Thus, economies of scale or increasing returns to scale are internal to the firm. External economies, on the other hand, refer to the reduction (i.e., downward shift) in each firm's average cost of production curve *as the entire industry output expands* (i.e., for reasons external to the firm). External economies and their importance for international trade are examined in the appendix to this chapter.

Finally, and somewhat related to economies of scale, is the hypothesis advanced by *Linder* in 1961 that a nation exports those manufactured products for which a large domestic market exists. These are products that appeal to the majority of the population. In the process of satisfying such a market, the nation acquires the necessary experience and efficiency to be able subsequently to export these commodities to other nations with similar tastes and income levels. The nation will import those products that appeal to its low- and high-income minorities. According to this "preference similarity" or "overlapping demands" hypothesis, trade in manufactures is likely to be largest among countries with similar tastes and income levels. While confirmed for his native Sweden, Linder's hypothesis has not been confirmed for other nations. It also cannot explain, for example, why such non-Christian nations as Japan and Korea export artificial Christmas trees and Christmas cards in the absence of a domestic market for these products.

6.4 Imperfect Competition and International Trade

In this section, we examine the very important relationship between imperfect competition and international trade, first from an intuitive level and then with a formal model. We also discuss a method of measuring intra-industry trade.

6.4A Trade Based on Product Differentiation

A large portion of the output of modern economies today involves differentiated rather than homogeneous products. Thus, a Chevrolet is not identical to a Toyota, a Volkswagen, a Volvo, or a Renault. As a result, a great deal of international trade can and does involve the exchange of differentiated products of the same industry or broad product group. That is, a great deal of international trade is intra-industry trade in differentiated products, as opposed to inter-industry trade in completely different products (see Case Study 6-3).

CASE STUDY 6-3 U.S. Intra-Industry Trade in Automotive Products

Table 6.2 shows U.S. imports from and exports of automotive products (automobiles and automobile parts, engines, and bodies) to Canada, Mexico, Europe, and Japan in 1965, 1973, 1980, 1985, 1990, 1995, 2000, 2005, and 2010. Automobile and automotive products of various producers in different nations are not identical but differentiated and thus give rise to intra-industry trade. The very rapid growth of U.S. intra-industry trade in automotive products between 1965 and 2010 was due to the reduction in trade protection and transportation costs and, in the case of U.S. trade with Canada, to the U.S.-Canadian auto agreement of 1965, which established free trade for these products between the two countries. This enabled Canada to reduce the number of models it produced (thereby achieving greater economies of scale in production), while at the same time increasing the number of models available to Canadian consumers through imports from the United States. U.S.-Mexican intra-industry trade in automotive products also grew very rapidly as a result of NAFTA (North American Free Trade Agreement), which took effect on January 1, 1994. NAFTA is discussed in detail in Chapter 10. In the future, big-car production is likely to be concentrated in the United States and Canada, while small-car production is likely to shift to Mexico. Note the largely two-way nature of U.S. trade in automotive products with Canada, Mexico, and Latin America, as opposed to the mostly one-way trade with Japan. The decline in trade in automotive products in 2010 (except with Mexico) was due to the slow growth in the world economy.

(continued)

■ CASE STUDY 6-3 **Continued**

■ **TABLE 6.2.** U.S. Imports and Exports of Automotive Products (billions of dollars)

Year	Canada	Mexico	Europe	Japan	World
Imports					
1965	.11	–	.07	.01	.19
1973	4.92	–	3.14	2.41	10.55
1980	7.87	.22	6.73	11.85	26.94
1985	20.77	2.93	11.84	24.55	58.57
1990	27.71	4.39	13.27	30.12	79.32
1995	41.63	12.11	15.65	34.94	108.02
2000	58.75	28.30	29.11	44.49	170.20
2005	64.42	29.86	43.06	49.37	205.45
2010	47.96	43.73	33.63	42.92	189.76
Exports					
1965	.62	–	.07	–	.87
1973	4.12	–	.48	.09	6.03
1980	9.54	1.35	1.46	.19	16.74
1985	16.32	2.72	1.15	.21	21.07
1990	19.48	3.57	3.65	1.52	32.55
1995	28.94	5.14	5.45	4.07	52.51
2000	38.23	13.28	6.55	2.73	67.20
2005	45.77	13.55	10.41	1.45	85.99
2010	43.05	17.14	9.73	1.24	99.51

Source: WTO, *International Trade Statistics* (Geneva, various issues).

Intra-industry trade arises in order to take advantage of important economies of scale in production. That is, international competition forces each firm or plant in industrial countries to produce only one, or at most a few, varieties and styles of the same product rather than many different varieties and styles. This is crucial in keeping unit costs low. With few varieties and styles, more specialized and faster machinery can be developed for a continuous operation and a longer production run. The nation then imports other varieties and styles from other nations. Intra-industry trade benefits consumers because of the wider range of choices (i.e., the greater variety of differentiated products) available at the lower prices made possible by economies of scale in production. Case Study 6-4 examines the large welfare gains that arise from the ability of consumers to greatly increase the variety of goods that they can purchase with trade.

The importance of intra-industry trade became apparent when tariffs and other obstructions to the flow of trade among members of the European Union, or Common Market, were removed in 1958. *Balassa* found that the volume of trade surged, but most of the increase involved the exchange of differentiated products *within* each broad industrial classification. That is, German cars were exchanged for French and Italian cars, French washing machines were exchanged for German washing machines, Italian typewriters for German and French typewriters, and so on.

Even before the formation of the European Union, plant size in most industries was about the same in Europe and the United States. However, unit costs were

CASE STUDY 6-4 Variety Gains with International Trade

Until now, the welfare gains from trade have been measured by the reduction in the price of imported goods and their greater consumption. But another very important gain from trade arises from the large increase in the variety of goods available for consumers to purchase as a result of international trade. *Broda and Weinstein* estimate that American consumers would have been willing to pay an extra $280 billion, or about 3 percent of GDP, to have access to the variety of goods that were available in 2001, rather than what they could have bought in 1972. The number of varieties of goods available to American consumers increased from 74,667 (7,731 more goods from an average of 9.7 countries) in 1972 to 259,215 (16,390 goods from an average of 15.8 countries) in 2001. The authors estimate that the conventional import price index, therefore, overestimates the price of imports by about 1.2 percent per year by not taking into account the higher value that variety brings.

The gains from trade resulting from making available to consumers a much larger variety of each type of good are much greater for developing countries that only recently opened up more widely to international trade. China is the country that received the largest gain—a whopping 326.1 percent of GDP—from the much greater variety of goods available in 1997 (after China opened up its economy to international trade) compared to those available to Chinese consumers in 1972 (when China was, for the most part, a closed economy). The former Soviet Union follows with a gain of 213.7 percent of GDP. There is then South Korea with a gain of 185.3 percent of GDP and Taiwan with 126.9 percent gain. In fact, all the other 19 countries that the authors study had gains in the double digits (as compared with a gain of 3 percent of GDP for the United States), because the U.S. economy has always been one of the most open during the past three decades covered by the study (and therefore the one that gained the least as a percentage of GDP). From their study of U.S. automobile imports, *Blonigen and Soderbery* (2010) believe, however, that U.S. net gain from variety is likely to be much greater.

Sources: C. Broda and D. Weinstein, “Are We Underestimating the Gains from Globalization for the United States?” *Current Issue in Economics and Finance*, Federal Reserve Bank of New York, April 2005, pp. 1–7; C. Broda and D. Weinstein, “Variety Growth and World Welfare,” *American Economic Review*, May 2005, pp. 139–144; and B. A. Blonigen and A. Soderbery, “Measuring the Benefits of Foreign Products Variety with an Accurate Variety Set,” *Journal of International Economics*, November 2010, pp. 168–180.

much higher in Europe, primarily because European plants produced many more varieties and styles of a product than did their American counterparts. As tariffs were reduced and finally eliminated and trade expanded within the European Union, each plant could specialize in the production of only a few varieties and styles of a product, and unit costs fell sharply as a result.

Several other interesting considerations must be pointed out with respect to the intra-industry trade models developed by *Helpman, Krugman, Lancaster*, and others since 1979. First, although trade in the H–O model is based on comparative advantage or differences in factor endowments (labor, capital, natural resources, and technology) among nations, intra-industry trade is based on product differentiation and economies of scale. Thus, while trade based on comparative advantage is likely to be larger when the difference in factor endowments among nations is greater, intra-industry trade is likely to be larger among industrial economies of similar size and factor proportions (when factors of production are broadly defined).

Second, with differentiated products produced under economies of scale, pretrade-relative commodity prices may no longer accurately predict the pattern of trade. Specifically, a large country may produce a commodity at lower cost than a smaller country in the absence of trade because of larger national economies of scale. With trade, however, all countries can take advantage of economies of scale to the same extent, and the smaller country could conceivably undersell the larger nation in the same commodity.

Third, in contrast to the H–O model, which predicts that trade will lower the return of the nation's scarce factor, with intra-industry trade based on economies of scale it is possible for all factors to gain. This may explain why the formation of the European Union and the great postwar trade liberalization in manufactured goods met little resistance from interest groups. This is to be contrasted to the strong objections raised by labor in industrial countries against liberalizing trade with some of the most advanced of the developing countries because this trade, being of the inter- rather than of the intra-industry trade type, could lead to the collapse of entire industries (such as the textile industry) and involve lower real wages and massive reallocations of labor to other industries in industrial nations.

Finally, intra-industry trade is related to the sharp increase in international trade in parts and components of a product, or outsourcing. As we have seen in Case Study 6-1, international corporations often produce or import various parts of a product in different nations in order to minimize their costs of production (international economies of scale). The utilization of each nation's comparative advantage to minimize total production costs can be regarded as an extension of the basic H–O model to modern production conditions. This pattern also provides greatly needed employment opportunities in some developing nations. We will return to this topic in Chapter 12, which deals with international resource movements and multinational corporations.

The tentative conclusion that can be reached, therefore, is that comparative advantage seems to determine the pattern of *inter-industry trade*, while economies of scale in differentiated products give rise to *intra-industry trade*. Both types of international trade occur in today's world. The more dissimilar are factor endowments (as between developed and developing countries), the more important are comparative advantage and inter-industry trade. On the other hand, intra-industry trade is likely to be dominant the more similar are factor endowments broadly defined (as among developed countries). As *Lancaster* (1980) pointed out, however, even in the case of intra-industry trade, "comparative advantage is somewhere in the background." One could say that inter-industry trade reflects *natural* comparative advantage while intra-industry trade reflects *acquired* comparative advantage.

More importantly, the more recent empirical tests of the H–O theory discussed in Section 5.6 showed that by allowing for differences in technology and factor prices across countries, for the existence of nontraded goods and transportation costs, and by utilizing more disaggregated factor endowments and trade data, a great deal of intra-industry trade is in fact based on international differences in factor endowments and comparative costs. Thus, there seems to be much less conflict between intra-industry and the H–O theories than might appear at first sight. That is, a great deal of intra-industry trade is in fact consistent with trade based on differences in factor endowments and comparative costs. For example, the importation of a computer from Mexico by the United States may in fact involve the re-export of U.S. computer chips produced with highly skilled U.S. labor, as well as the export of other less-skilled Mexican labor embodied into the computer.

6.4B Measuring Intra-Industry Trade

The level of intra-industry trade can be measured by the intra-industry trade index (T):

$$T = 1 - \frac{|X - M|}{X + M} \tag{6-1}$$

where X and M represent, respectively, the value of exports and imports of a particular industry or commodity group and the vertical bars in the numerator of Equation (6-1) denote the absolute value. The value of T ranges from 0 to 1. $T = 0$ when a country only exports or only imports the good in question (i.e., there is no intra-industry trade). On the other hand, if the exports and imports of a good are equal, $T = 1$ (i.e., intra-industry trade is maximum).

Grubel and Lloyd calculated the T index for various industries in 10 industrial countries for the year 1967. They found that the weighted average of T for the 10 industrial countries

CASE STUDY 6-5 Growth of Intra-Industry Trade

Table 6.3 presents data on the share of intra-industry trade in manufactured products of industrial countries in 1988–1991 and 1996–2000. The table shows that in 1996–2000, France had the highest level of intra-industry trade (77.5), followed by Canada (76.2) and Austria (74.2). For the other G-7 countries, the United Kingdom had an index of 73.7, Germany 72.0, the United States 68.5, Italy 64.7, and Japan 47.6. The highest indices were for European countries (except for Canada, Mexico, and the United States) and the lowest were for Pacific and developing countries (except for Norway and Greece). The highest percentage growth in the index between the two periods was for Hungary, Korea, Mexico, and Japan. For some countries (such as Belgium/Luxembourg, Greece, and Ireland), the index actually declined.

TABLE 6.3. Manufacturing Intra-Industry Trade as a Percentage of Total Manufacturing Trade in Selected Countries

Country	1988–1991	1996–2000	Country	1988–1991	1996–2000
France	75.9	77.5	Denmark	61.6	64.8
Canada	73.5	76.2	Italy	61.6	64.7
Austria	71.8	74.2	Poland	56.4	62.6
United Kingdom	70.1	73.7	Portugal	52.4	61.3
Mexico	62.5	73.4	Korea	41.4	57.5
Hungary	54.9	72.1	Ireland	58.6	54.6
Switzerland	69.8	72.0	Finland	53.8	53.9
Germany	67.1	72.0	Japan	37.6	47.6
Belgium/Luxembourg	77.6	71.4	New Zealand	37.2	40.6
Spain	68.2	71.2	Turkey	36.7	40.0
Netherlands	69.2	68.9	Norway	40.0	37.1
United States	63.5	68.5	Greece	42.8	36.9
Sweden	64.2	66.6	Australia	28.6	29.8

Source: OECD, ''Intra-Industry Trade,'' *Economic Outlook* (Paris: OECD, June 2002), pp. 159–163.

ranged from 0.30 for mineral fuels, lubricants, and related industries to 0.66 for chemicals, for an overall or combined weighted average of T for all industries in all 10 countries of 0.48. This means that in 1967 nearly half of all the trade among these 10 industrial countries involved the exchange of differentiated products of the same industry. The value of T has also risen over time. It was 0.36 in 1959, 0.42 in 1964, and 0.48 in 1967. Case Study 6-5 presents some more recent estimates of intra-industry trade for the leading industrial and developing countries.

There is a serious shortcoming in using the index T to measure the degree of intra-industry trade, however. This results from the fact that we get very different values for T, depending on how broadly we define the industry or product group. Specifically, the more broadly we define an industry, the greater will be the value of T. The reason for this is that the more broadly an industry is defined, the more likely it is that a country will export some varieties of the differentiated product and import others. Thus, the T index must be used with caution. It can, nevertheless, be very useful in measuring differences in intra-industry trade in different industries and changes in intra-industry trade for the same industry over time (see Case Studies 6-5 and 6-6).

CASE STUDY 6-6 Intra-Industry Trade Indexes for G-20 Countries

Table 6.4 gives intra-industry trade indexes for the G-20 (the largest and most important advanced and emerging market economies plus the European Union as a whole) in 2006 at the SITC 3-digit and 5-digit levels. An index of 0.000 indicates no intra-industry trade, whereas an index of 1.0 indicates that the exports and imports of the country are equal in each product category. We would expect that for each country the intra-industry trade index at the 3-digit level be greater than that at the 5-digit level (i.e., the greater the degree of aggregation—for example, transportation equipment, which includes automotive products, trains, airplanes as compared simply to automobiles—the higher the intra-industry trade index). From the table, we can see that the index for developed countries is generally higher than for the other G-20.

TABLE 6.4. Intra-Industry Trade Indexes at the 3-Digit and 5-Digits Levels for the G-20 in 2006

Country	SITC-3 Digit	SITC-5 Digit	Country	SITC-3 Digit	SITC-5 Digit
France	0.600	0.424	Brazil	0.373	0.137
Canada	0.599	0.421	India	0.318	0.127
Germany	0.570	0.419	Argentina	0.313	0.156
United Kingdom	0.525	0.362	China	0.305	0.182
United States	0.503	0.317	South Africa	0.294	0.092
Italy	0.497	0.344	Indonesia	0.291	0.117
Mexico	0.478	0.334	Turkey	0.217	0.130
Thailand	0.449	0.252	Russia	0.146	0.047
Korea	0.412	0.240	Saudi Arabia	0.070	0.011
Japan	0.398	0.238	*Unweighted Average*	*0.387*	*0.229*

Source: M. Brülhart, ''Global Intra-Industry Trade, 1962-2006,'' *The World Economy*, March 2009, pp. 401–459.

6.4C Formal Model of Intra-Industry Trade

Figure 6.2 presents a formal model of intra-industry trade. In Figure 6.2, D represents the demand curve faced by the firm for the differentiated products that it sells. Since many other firms sell similar products, the demand curve faced by the firm is fairly elastic (i.e., D has a small inclination). This means that a small price change leads to a large change in the firm's sales. The form or market organization where (as in this case) there are many firms selling a differentiated product and entry into or exit from the industry is easy is called monopolistic competition. Because the firm must lower the price (P) on all units of the commodity if it wants to increase sales, the marginal revenue curve of the firm (MR) is below the demand curve (D), so that $MR < P$. For example, D shows that the firm can sell 2 units at $P =$ \$4.50 and have a total revenue of \$9 or sell 3 units at $P =$ \$4 and have a total revenue of \$12. Thus, the change in total revenue or $MR =$ \$3, compared with $P =$ \$4 for the third unit of the commodity sold.

By producing only one of a few varieties of the product, the firm also faces increasing returns to scale in production, so that its average cost curve (AC) is also downward sloping (i.e., AC declines as output increases). As a result, the firm's marginal cost curve (MC) is below the AC curve. The reason for this is that for AC to decline, MC must be smaller than AC. The best level of output for the firm is 3 units and is given by point E, where the MR and MC curves intersect (see Figure 6.2). At a smaller level of output, MR (i.e., the extra revenue) exceeds MC (i.e., the extra cost) and it pays for the firm to expand output.

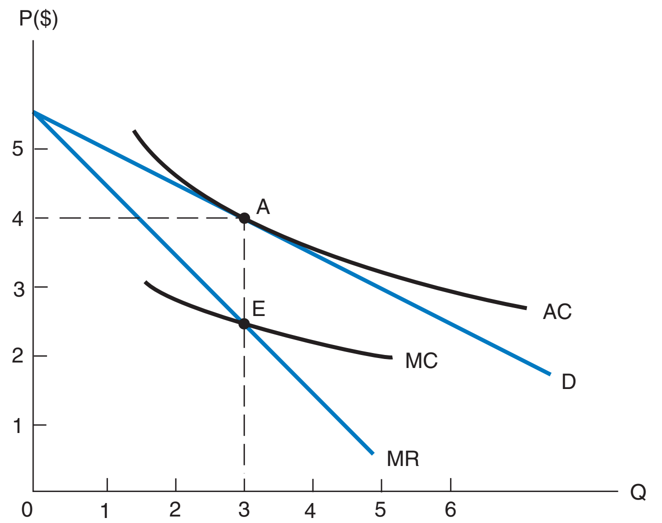

FIGURE 6.2. Production and Pricing under Monopolistic Competition.
D is the demand curve for the product sold by a firm, while MR is the corresponding marginal revenue curve. D is downward sloping because the product is differentiated. As a result, $MR < P$. The best level of output for the monopolistically competitive firm is 3 units and is given by point E, at which $MR = MC$. At $Q = 3$, $P = AC =$ \$4 (point A) and the firm breaks even (i.e., earns only a normal return on investment in the long run). AC is the average cost curve of the firm. AC is downward sloping because of economies of scale.

On the other hand, at an output greater than 3 units, $MR < MC$ and it pays for the firm to reduce output. Thus, the best level of output (Q) is 3 units. The firm will then charge the price of \$4, shown by point A on the D curve. Furthermore, since more firms are attracted to the industry in the long run whenever firms in the industry earn profits, the demand curve facing this firm (D) is tangent to its AC curve, so that $P = AC = \$4$ at $Q = 3$. This means that the firm breaks even (i.e., it earns only a normal return on investment in the long run).

We can now examine the relationship between inter-industry and intra-industry trade. To do this, suppose that Nation 1 has a relative abundance of labor and commodity X is labor intensive, while Nation 2 has a relative abundance of capital and commodity Y is capital intensive. If commodities X and Y are homogeneous, Nation 1 will export commodity X and import commodity Y, while Nation 2 will export commodity Y and import commodity X, as postulated by the Heckscher–Ohlin theory. This is inter-industry trade and reflects comparative advantage only. On the other hand, if there are different varieties of commodities X and Y (i.e., commodities X and Y are differentiated), Nation 1 will still be a net exporter of commodity X (this is inter-industry trade, which is based on comparative advantage), but it will also import some varieties of commodity X and export some varieties of commodity Y (this is intra-industry trade, which is based on product differentiation and economies of scale).

Similarly, while Nation 2 will still be a net exporter of commodity Y, it will also import some varieties of commodity Y and export some varieties of commodity X. The net exports of X and Y by Nations 1 and 2, respectively, reflect inter-industry trade, which is based on comparative advantage. On the other hand, the fact that Nation 1 also imports some varieties of commodity X and exports some varieties of commodity Y, while Nation 2 also imports some varieties of commodity Y and exports some varieties of commodity X (i.e., the fact that there is an interpenetration of each other's market in each product) reflects intra-industry trade, which is based on product differentiation and economies of scale. Thus, when products are homogeneous, we have only inter-industry trade. On the other hand, when products are differentiated, we have both inter- and intra-industry trade. The more similar nations are in factor endowments and technology, the smaller is the importance of inter-relative to intra-industry trade, and vice versa. Since industrial nations have become more similar in factor endowments and technology over time, the importance of intra-relative to inter-industry trade has increased. As pointed out earlier, however, a great deal of intra-industry trade is also based on differences in international factor endowments (when factors are defined less broadly and in a more disaggregated way).

6.4D Another Version of the Intra-Industry Trade Model

We now examine intra-industry trade from a different perspective with the aid of Figure 6.3. The horizontal axis in Figure 6.3 measures the number of firms (N) in a monopolistically competitive industry, while the vertical axis measures the product price (P) and the average or per unit cost of production (AC). All firms sell at the same price even though their product is somewhat differentiated. This will be true if all firms in the monopolistically competitive industry are symmetric or face identical demand and cost functions or conditions.

In Figure 6.3, curve P shows the relationship between the number of firms in the industry and the product price. Curve P is negatively sloped, showing that the larger the number of firms in the industry the lower is the product price because competition is greater or more intense with more firms in the industry. For example, $P = \$4$ when $N = 200$ (see point

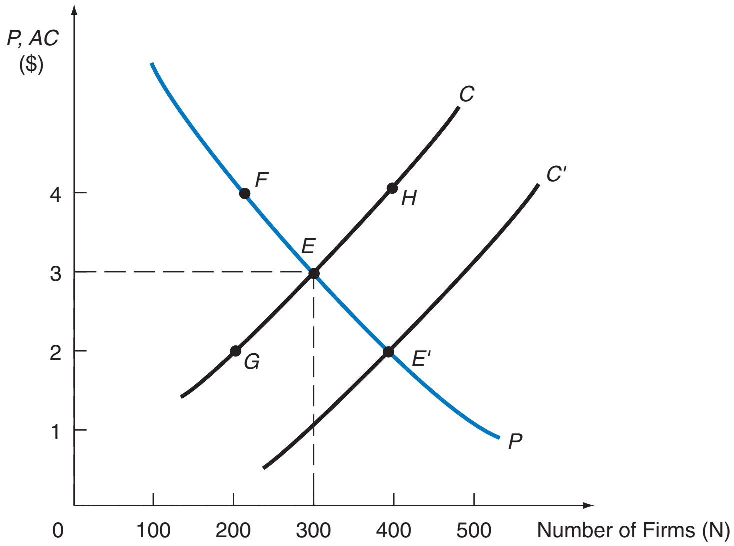

FIGURE 6.3. Monopolistic Competition and Intra-Industry Trade.
Curve *P* shows the negative relationship between the total number of firms in the industry *(N)* and product price *(P)*, while curve *C* shows the positive relationship between *N* and their average cost of production *(AC)* for a given level of industry output. Equilibrium is given by the intersection of the *P* and *C* curves at point *E*, where $P = AC =$ \$3 and $N = 300$. Trade causes curve *C* to shift down to, say, curve C' and defines new equilibrium point E', where $P =$ \$2 and $N = 400$.

F in the figure), $P =$ \$3 when $N = 300$ (point E), and $P =$ \$2 when $N = 400$ (point E'). Curve C, on the other hand, shows the relationship between the number of firms in the industry and their average cost of production for a given level of industry output. Curve C is positively sloped, showing that the larger N is, the greater their AC is. The reason is that when more firms produce a given industry output, each firm's share of the industry output will be smaller, and so each firm will incur higher average costs of production. For example, $AC =$ \$2 when $N = 200$ (point G in the figure), $AC =$ \$3 when $N = 300$ (point E), and $AC =$ \$4 when $N = 400$ (point H).

The intersection of curve P and curve C defines equilibrium point E, at which $P = AC =$ \$3 and $N = 300$ and each firm breaks even (i.e., makes zero profits). With 200 firms, $P =$ \$4 (point F), while $AC =$ \$2 (point G). Since firms will then be earning profits, more firms will enter the industry until long-run equilibrium point E is reached. On the other hand, with $N = 400$, $P =$ \$2 (point E'), while $AC =$ \$4 (point H). Since now all firms incur losses, some firms will leave the industry until long-run equilibrium point E is reached.

By opening up or expanding international trade and thus becoming part of a much larger integrated world market, firms in each nation can specialize in the production of a smaller range of products and face lower average costs of production. Mutually beneficial trade can then take place even if nations are identical in factor endowments and technology. Consumers in each nation would benefit both from lower product prices and from the larger range of commodities. This is shown by the downward shift of curve C to curve C′ in Figure 6.3. Curve C shifts down to curve C' because an increase in market size or total industry sales increases the sales of each firm, for any given number of firms in the industry, and lowers the average production cost of each firm. The downward shift in curve C to curve C' leads to new long-run equilibrium point E', $P = AC = \$2$ and $N = 400$, as compared with original equilibrium point E (with $P = \$3$ and $AC = \$3$). Note that the increase in total industry sales does not affect the P curve (i.e., the P curve does not shift).

6.5 Trade Based on Dynamic Technological Differences

Apart from differences in the relative availability of labor, capital, and natural resources (stressed by the Heckscher–Ohlin theory) and the existence of economies of scale and product differentiation, dynamic changes in technology among nations can be a separate determinant of international trade. These are examined by the technological gap and product cycle models. Since time is involved in a fundamental way in both of these models, they can be regarded as dynamic extensions of the static H–O model.

6.5A Technological Gap and Product Cycle Models

According to the technological gap model sketched by *Posner* in 1961, a great deal of the trade among industrialized countries is based on the introduction of new products and new production processes. These give the innovating firm and nation a *temporary* monopoly in the world market. Such a temporary monopoly is often based on patents and copyrights, which are granted to stimulate the flow of inventions.

As the most technologically advanced nation, the United States exports a large number of new high-technology products. However, as foreign producers acquire the new technology, they eventually are able to conquer markets abroad, and even the U.S. market for the product, because of their lower labor costs. In the meantime, U.S. producers may have introduced still newer products and production processes and may be able to export these products based on the new technological gap established. A shortcoming of this model, however, is that it does not explain the size of technological gaps and does not explore the reason that technological gaps arise or exactly how they are eliminated over time.

A generalization and extension of the technological gap model is the product cycle model, which was fully developed by *Vernon* in 1966. According to this model, when a new product is introduced, it usually requires highly skilled labor to produce. As the product matures and acquires mass acceptance, it becomes standardized; it can then be produced by mass production techniques and less skilled labor. Therefore, comparative advantage in the product shifts from the advanced nation that originally introduced it to less advanced nations, where labor is relatively cheaper. This may be accompanied by foreign direct investments from the innovating nation to nations with cheaper labor.

Vernon also pointed out that high-income and labor-saving products are most likely to be introduced in rich nations because (1) the opportunities for doing so are greatest there, (2) the development of these new products requires proximity to markets so as to benefit from consumer feedback in modifying the product, and (3) there is a need to provide service. While the technological gap model emphasizes the time lag in the *imitation* process, the product cycle model stresses the *standardization* process. According to these models, the most highly industrialized economies are expected to export nonstandardized products embodying new and more advanced technologies and import products embodying old or less advanced technologies.

A classic example of the product cycle model is provided by the experience of U.S. and Japanese radio manufacturers since World War II. Immediately after the war, U.S. firms dominated the international market for radios, based on vacuum tubes developed in the United States. However, within a few years, Japan was able to capture a large share of the market by copying U.S. technology and utilizing cheaper labor. The United States recaptured technological leadership with the development of transistors. But, once again, in a few short years, Japan imitated the technology and was able to undersell the United States. Subsequently, the United States reacquired its ability to compete successfully with Japan by introducing printed circuits. It remains to be seen whether this latest technology will finally result in radios being labor or capital intensive and whether the United States will be able to stay in the market—or whether both the United States and Japan will eventually be displaced by still cheaper producers in such nations as Korea and Singapore.

In a 1967 study, *Gruber, Mehta, and Vernon* found a strong correlation between expenditures on research and development (R&D) and export performance. The authors took expenditures on research and development as a proxy for the *temporary* comparative advantage that firms and nations acquire in new products and new production processes. As such, these results tend to support both the technological gap model and the closely related product cycle model. We will see in Chapter 7 that the technological lead of the United States based on R&D has now almost disappeared with respect to Europe and Japan and has sharply narrowed with respect to some of the most advanced emerging markets such as China.

Note that trade in these models is originally based on new technology developed by the relatively abundant factors in industrialized nations (such as highly skilled labor and expenditures on research and development). Subsequently, through imitation and product standardization, less developed nations gain a comparative advantage based on their relatively cheaper labor. As such, trade can be said to be based on changes in relative factor abundance (technology) among nations over time. Therefore, the technological gap and product cycle models can be regarded as extensions of the basic H–O model into a technologically dynamic world, rather than as alternative trade models. In short, the product cycle model tries to explain *dynamic* comparative advantage for new products and new production processes, as opposed to the *basic* H–O model, which explains *static* comparative advantage. We return to this source of growth and change in comparative advantage over time in the next chapter.

6.5B Illustration of the Product Cycle Model

The product cycle model can be visualized with Figure 6.4, which identifies five different stages in the life cycle of a product (according to one version of the model) from the point of view of the innovating and the imitating country. In stage I, or new-product phase (referring to time *OA* on the horizontal axis), the product (at this time a specialty) is produced and consumed only in the innovating country. In stage II, or product-growth phase (time *AB*), production is perfected in the innovating country and increases rapidly to accommodate rising demand at home and abroad. At this stage, there is not yet any foreign production of the product, so that the innovating country has a monopoly in both the home and export markets.

In stage III, or product-maturity phase (time *BC*), the product becomes standardized, and the innovating firm may find it profitable to license other domestic and foreign firms to also manufacture the product. Thus, the imitating country starts producing the product

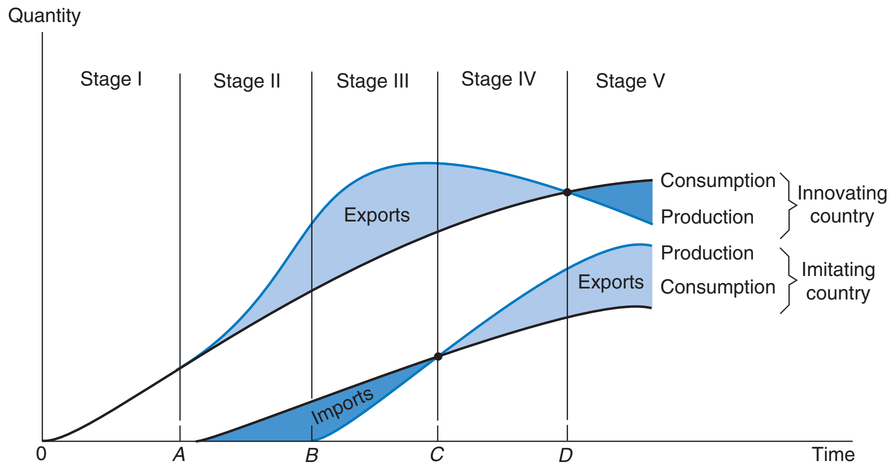

FIGURE 6.4. The Product Cycle Model.
In stage I (time *OA*), the product is produced and consumed only in the innovating country. In stage II *(AB)*, production is perfected in the innovating country and increases rapidly to accommodate rising demand at home and abroad. In stage III *(BC)*, the product becomes standardized and the imitating country starts producing the product for domestic consumption. In stage IV *(CD)*, the imitating country starts underselling the innovating country in third markets, and in stage V (past point *D*) in the latter's market as well.

for domestic consumption. In stage IV (time *CD*), the imitating country, facing lower labor and other costs now that the product has become standardized and no longer requires development and engineering skills, begins to undersell the innovating country in third markets, and production of the product in the innovating country declines. Brand competition now gives way to price competition. Finally, in stage V (i.e., past point *D*), the imitating country starts underselling the innovating country in the latter's market as well, and production of the product in the innovating country declines rapidly or collapses. Stages IV and V are often referred to as the product-decline stage. Technological diffusion, standardization, and lower costs abroad thus bring the end of the life cycle for the product. It is now time for the innovating country to concentrate attention on new technological innovations and to introduce new products.

Examples of products that seem to have gone through such product cycles are radios, stainless steel, razor blades, television sets, and semiconductors. In recent years, the diffusion lag of new technologies has shortened considerably, so that we have witnessed a time compression of the product life cycle. That is, the time from the introduction of a new product in the innovating country to the time when the imitating country displaces the innovating country in third markets and in the innovating country itself has become shorter and shorter. This may spell trouble for a country like the United States, which relies on new technologies and new products to remain internationally competitive. The benefits that the United States can reap from the new technologies and new products that it introduces are ever more quickly copied by other countries, especially Japan. In fact, Steven Jobs' Apple created the iPad but it outsourced all of its production! The old saying "The United States must run faster and faster simply to avoid falling behind" is very appropriate here. By turning out new products and technologies very rapidly, however, the United States is ranked as the most competitive economy in the world (see Case Study 6-7).

CASE STUDY 6-7 The United States as the Most Competitive Economy

Table 6.5 shows the 20 top-ranked nations in international competitiveness in 2011, as measured by the Switzerland-based Institute for Management Development (IMD). *International competitiveness* was defined as the ability of a country or company to generate more wealth for its people than its competitors in world markets. International competitiveness was calculated as the weighted average of more than 300 competitiveness criteria grouped into four large categories: (1) economic performance (macroeconomic evaluation of the domestic economy); (2) government performance (extent to which government policies are conducive to competitiveness); (3) business efficiency (extent to which enterprises perform in an innovative and profitable way); and (4) infrastructure (extent to which basic technological, scientific, and human resources meet the needs of business).

As Table 6.5 shows, Hong Kong occupies the top position, followed by the United States, Switzerland, Singapore, Sweden, and Canada. Germany is ninth and the United Kingdom is eighteenth. Of the G-7 countries, Japan is twenty-seventh, France is twenty-ninth, and Italy is fortieth.

TABLE 6.5. International Competitiveness Rankings in 2012

Rank	Country	Rank	Country
1	Hong Kong	11	Netherlands
2	United States	12	Luxembourg
3	Switzerland	13	Denmark
4	Singapore	14	Malaysia
5	Sweden	15	Australia
6	Canada	16	United Arab Rep.
7	Taiwan	17	Finland
8	Norway	18	United Kingdom
9	Germany	19	Israel
10	Qatar	20	Ireland

Source: Institute for Management Development, 2012.

6.6 Costs of Transportation, Environmental Standards, and International Trade

So far we have assumed that costs of transportation are zero (assumption 9 in Section 5.2). In this section, we relax this assumption. We will see that costs of transportation affect international trade directly by affecting the price of the traded commodity in the exporting and importing countries, and indirectly by affecting the international location of production and industry. We also examine these two effects as well as the effect of environmental pollution on the location of industry and international trade.

6.6A Costs of Transportation and Nontraded Commodities

Costs of transportation include freight charges, warehousing costs, costs of loading and unloading, insurance premiums, and interest charges while goods are in transit. We will use the term transport or logistics costs to include all the costs of transferring goods from one location (nation) to another.

A homogeneous good will be traded internationally only if the pretrade price difference in the two nations exceeds the cost of transporting the good from one nation to the other. Consideration of transport and logistics costs explains why most goods and services are not traded at all internationally. These are referred to as nontraded goods and services. They are the goods and services for which transport costs exceed price differences across nations. Thus, cement is not traded internationally except in border areas because of its high weight-to-value ratio. Similarly, the average person does not travel from New York to London simply to get a haircut.

In general, the price of nontraded commodities is determined by domestic demand and supply conditions, while the price of traded commodities is determined by world demand and supply conditions. The great reduction in transport costs that resulted from using refrigerated trucks and ships converted many nontraded into traded goods. For example, grapes and other fruits and vegetables found in many Boston, Chicago, New York, and Philadelphia stores during winter are shipped from South America. In the past, high transport costs and spoilage prevented this. Similarly, the development of containerized cargo shipping (i.e., the packing of goods in very large, standardized containers) greatly reduced the cost of handling and transporting goods, turning many previously nontraded commodities into traded ones.

There are two ways of analyzing transport costs. One is by general equilibrium analysis, which utilizes the nation's production frontiers or offer curves and expresses transport costs in terms of relative commodity prices. A more straightforward method is to analyze the absolute, or money, cost of transport with partial equilibrium analysis. This holds constant the rate of exchange between the two currencies, the level of income, and everything else in the two nations, except the amount produced, consumed, and traded of the commodity under consideration. This is shown in Figure 6.5.

In Figure 6.5, the common vertical axis measures the dollar price of commodity X in Nation 1 and in Nation 2. Increasing quantities of commodity X are measured by a movement to the right from the common origin (as usual) for Nation 2. Increasing quantities of commodity X for Nation 1 are instead measured by a movement to the left from the common origin. Note that Nation 1's demand curve for commodity X (D_X) is negatively inclined (slopes downward), while its supply curve of commodity X (S_X) is positively inclined, *as we move from the origin to the left*, as we should, for Nation 1.

In the absence of trade, Nation 1 produces and consumes 50X at the equilibrium price of $P_X = \$5$ (given by the intersection of D_X and S_X in Nation 1). Nation 2 produces and consumes 50X at $P_X = \$11$. With the opening of trade, Nation 1 will export commodity X to Nation 2. As it does, P_X rises in Nation 1 and falls in Nation 2. With a transport cost of $2 per unit, P_X in Nation 2 will exceed P_X in Nation 1 by $2. This cost will be shared by the two nations so as to balance trade. This occurs in Figure 6.5 when $P_X = \$7$ in Nation 1 and $P_X = \$9$ in Nation 2. At $P_X = \$7$, Nation 1 will produce 70X, consume domestically 30X, and export 40X to Nation 2. At $P_X = \$9$, Nation 2 will produce 30X, import 40X, and consume 70X.

Note that in the absence of transport costs, $P_X = \$8$ in both nations and 60X are traded. Thus, transport costs reduce the level of specialization in production and also the volume and gains from trade. Furthermore, since with transport costs the absolute (and relative) price of commodity X differs in the two nations, its factor price will not be completely equalized even if all the other assumptions of the H–O model hold.

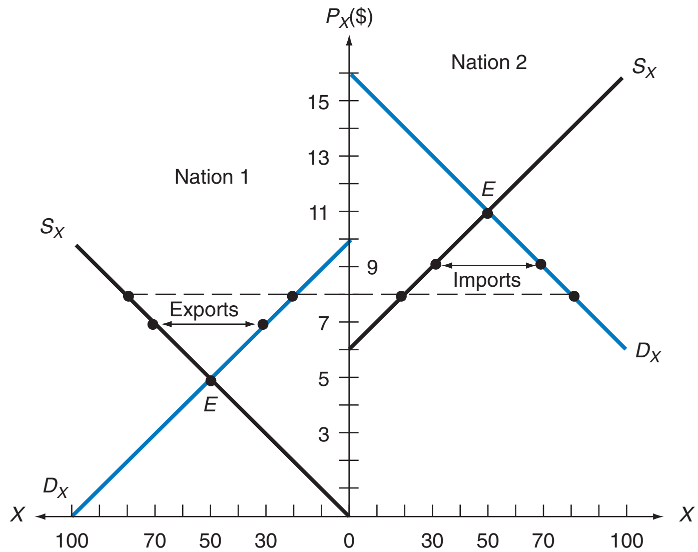

FIGURE 6.5. Partial Equilibrium Analysis of Transport Costs.
The common vertical axis measures the dollar price of commodity X in the two nations. A movement to the left from the common origin measures increasing quantities of commodity X for Nation 1. In the absence of trade, Nation 1 will produce and consume 50X at $P_X = \$5$. Nation 2 will produce and consume 50X at $P_X = \$11$. With transport costs of \$2 per unit, $P_X = \$7$ in Nation 1 and $P_X = \$9$ in Nation 2. At $P_X = \$7$, Nation 1 will produce 70X, consume 30X, and export 40X. At $P_X = \$9$, Nation 2 will produce 30X, import 40X, and consume 70X.

Finally, because of the way Figure 6.5 was drawn, the cost of transportation is shared equally by the two nations. In general, the more steeply inclined D_X and S_X are in Nation 1 relative to Nation 2, the greater is the share of transport costs paid by Nation 1. (The proof of this proposition and the general equilibrium analysis of transport costs are assigned as an end-of-chapter problem.)

6.6B Costs of Transportation and the Location of Industry

Transportation costs also affect international trade by influencing the location of production and industry. Industries can be classified as resource oriented, market oriented, or footloose.

Resource-oriented industries are those that tend to locate near the source of the raw materials used by the industry. For example, mining must obviously be located where the mineral deposits are located. More generally, resource-oriented industries are those for which the cost of transporting the raw materials used by the industry is substantially higher than for shipping the finished product to market. These are industries such as steel, basic chemicals, and aluminum, which process heavy and bulky raw materials into lighter finished products (i.e., involving substantial weight loss in processing).

Market-oriented industries, on the other hand, are those that locate near the markets for the products of the industry. These are the industries that produce goods that become heavier or more difficult to transport during the production process (i.e., that involve substantial weight gain in processing). An excellent example of this is provided by soft-drink companies, which ship their highly concentrated syrup to market, where water is added and bottling takes place (all very weight-gaining operations).

Footloose industries are those producing goods that face neither substantial weight gains nor losses during the production process. These industries tend to have high value-to-weight ratios and to be highly mobile, or footloose. They tend to locate where the availability of other inputs leads to the lowest overall manufacturing costs. An example is provided by U.S. computer companies, which ship U.S.-made components to Mexican border areas to be assembled by cheap Mexican labor, before being exported back to the United States to be packaged into the final product for sale on the U.S. market. Many governments offer preferential tax treatment to domestic and foreign investors to attract these footloose industries.

6.6c Environmental Standards, Industry Location, and International Trade

Industrial location and international trade are also affected by different environmental standards in different nations. Environmental standards refer to the levels of air pollution, water pollution, thermal (i.e., heat) pollution, and pollution resulting from garbage disposal that a nation allows. Environmental pollution results whenever the environment is used (abused) as a convenient and cheap dumping ground for all types of waste products arising from the production, consumption, or disposal of goods and services.

Environmental pollution can lead to serious trade problems because the price of traded goods and services often does not fully reflect social environmental costs. A nation with lower environmental standards can in effect use the environment as a resource endowment or as a factor of production in attracting polluting firms from abroad and achieving a comparative advantage in polluting goods and services. In fact, U.S. labor opposed NAFTA out of fear that many jobs would be lost in the United States as a result of U.S. firms migrating to Mexico to take advantage of much more lax environmental laws and lower cleanup costs. Environmental considerations were so strong that a side agreement on the environment had to be added to ensure the passage of NAFTA by the U.S. Congress. The High-Level Symposium on Trade and the Environment held in Geneva in March 1999 strongly recommended that trade agreements be subjected to environmental impact assessments.

A World Bank study by Low (1992) indicated that polluting or dirty industries and their exports have expanded faster than clean industries and their exports in poor developing countries than in rich developed countries. However, the study also found that as nations become richer, they voluntarily adopt more environmentally friendly approaches to economic development and become increasingly concerned about "sustainable development" (see Case Study 6-8).

In July 2001, a historic accord that set targets for industrialized countries to cut emission of greenhouse gases that contribute to global warming was signed as part of the implementation of the Kyoto Protocol on climate change signed in 1997. The United States refused to sign the agreement, calling its targets arbitrary and too costly to comply. At the UN conference on climate change held in Bali in December 2007, 190 nations (including the United States) signed an agreement to negotiate a new treaty to succeed the Kyoto protocol (due to expire in 2012), calling for the halving of the emission of heat-trapping gases by 2050.

CASE STUDY 6-8 Environmental Performance Index

Table 6.6 provides the ranking of 132 countries on the Environmental Performance Index (EPI) in 2012. EPI benchmarks the ability of nations to (1) reduce environmental stress to human health and (2) promote sound natural resource management, using 25 performance indicators grouped in six categories, which are then combined to create a single score.

Table 6.6 shows that Switzerland ranks first on EPI, followed by Latvia, Norway, Luxembourg, Costa Rica, France, Austria, Italy, the United Kingdom, and Sweden. The ranking of some of the other countries are: Germany (11), Japan (23), Brazil (30), Spain (32), Canada (37), South Korea (43), United States (49), Mexico (84), Russia (106), China (116), India (125)—all the way down to Iraq (132). In general, rich countries score high and poor countries low, with the poorest countries and petroleum-exporting countries scoring the lowest.

TABLE 6.6. Environmental Performance Index (EPI) Ranking in 2012

Countries with Highest Rank		Countries with Lowest Rank	
Rank	Country	Rank	Country
1.	Switzerland	123.	Lybia
2.	Latvia	124.	Bosnia and Herzegovina
3.	Norway	125.	India
4.	Luxembourg	126	Kuwait
5.	Costa Rica	127.	Yemen
6.	France	128.	South Africa
7.	Austria	129.	Kazakhstan
8.	Italy	130.	Uzbekistan
9.	United Kingdom	131.	Turkemistan
10.	Sweden	132.	Iraq

Source: 2012 Environmental Performance Index (http://epi.yale.edu/epi2012/rankings).

At the UN Climate Change Conference in Durban, South Africa, in December 2011, it was decided to extend the life of the Kyoto treaty and to negotiate a new pact by 2015 to take effect by 2020 that would include emission curbs also by developing countries, which now account for almost three-fifths of global emissions. The new pact is also to establish a \$100 billion "green climate fund" through which developed nations help developing nations offset the impact of environmental change.

SUMMARY

1. Heckscher and Ohlin based comparative advantage on the difference in factor endowments among nations. This theory, however, leaves a significant portion of today's international trade unexplained. To fill this gap, we need new, complementary theories that base international trade on economies of scale, imperfect competition, and differences in technological changes among nations.

2. Relaxing most of the assumptions only modifies but does not invalidate the Heckscher–Ohlin theory. Relaxing the assumptions of constant economies of scale, perfect competition, and no differences in technological changes among nations, however, requires new, complementary trade theories to explain the significant portion of international trade that the H–O model leaves unexplained.

3. Even if two nations are identical in every respect, there is still a basis for mutually beneficial trade based on economies of scale. When each nation specializes in the production of one commodity, the combined total world output of both commodities will be greater than without specialization when economies of scale are present. With trade, each nation then shares in these gains. Outsourcing and offshoring are the source of new and significant international economies of scale but also lead to complaints that a significant number of high-paying jobs are transferred abroad.

4. A large portion of international trade today involves the exchange of differentiated products. Such intra-industry trade arises in order to take advantage of important economies of scale in production, which result when each firm or plant produces only one or a few styles or varieties of a product. Intra-industry trade can be measured by an index. With differentiated products, the firm faces a downward-sloping demand curve, produces in the downward-sloping portion of its average cost curve, and breaks even. The larger the number of firms in a monopolistically competitive industry, the lower the product price and the higher the average cost for a given level of output. With the enlargement of the market that trade brings about, the commodity price will then be lower and the number of firms greater. The more similar nations are in factor endowments, the greater is the importance of intra- relative to inter-industry trade.

5. According to the technological gap model, a firm exports a new product until imitators in other countries take away its market. In the meantime, the innovating firm will have introduced a new product or process. According to the related product cycle model, a product goes through five stages: the introduction of the product, expansion of production for export, standardization and beginning of production abroad through imitation, foreign imitators underselling the nation in third markets, and foreigners underselling the innovating firms in their home market as well.

6. With transportation costs, only those commodities whose pretrade price difference exceeds the cost of transporting them will be traded. When trade is in equilibrium, the relative price of traded commodities in the two nations will differ by the cost of transporting them. Transportation costs also affect international trade by affecting the location of production and industry. Industries can be classified as resource oriented, market oriented, or footloose. Environmental standards also affect the location of industry and international trade.

A LOOK AHEAD

The international trade theory discussed so far is, with few exceptions (such as the product cycle model), static in nature. That is, given the resource endowments, technology, and tastes of two nations, we proceeded to determine the comparative advantage of each nation and examine the resulting gains from trade. In the next chapter, we will analyze in detail the effect of changes in factor endowments, technology, and tastes on the comparative advantage of each nation, the volume of trade, the terms of trade, and the welfare of each nation. Although this does not make our trade theory dynamic, it does show that it can be extended to incorporate the effect of changes in underlying conditions through time.

KEY TERMS

Differentiated products, p. 163
Dynamic external economies, p. 184
Environmental standards, p. 178
External economies, p. 162
Footloose industries, p. 178
General equilibrium analysis, p. 176
Increasing returns to scale, p. 159
Infant industry argument, p. 184
International economies of scale, p. 161
Intra-industry trade, p. 163
Intra-industry trade index (T), p. 167
Learning curve, p. 184
Market-oriented industries, p. 177
Monopolistic competition, p. 169
Monopoly, p. 161

Nontraded goods and services, p. 176
Offshoring, p. 161
Oligopoly, p. 161
Outsourcing, p. 161
Partial equilibrium analysis, p. 176
Product cycle model, p. 172
Resource-oriented industries, p. 177
Technological gap model, p. 172
Transport or logistics costs, p. 176

QUESTIONS FOR REVIEW

1. What are two important limitations of the Heckscher–Ohlin theory?

2. Which assumptions of the Heckscher–Ohlin theory can be relaxed without invalidating the model?

3. The relaxation of which assumptions of the Heckscher–Ohlin theory require new, complementary trade theories to explain the significant portion of international trade not explained by the H–O model?

4. What is meant by economies of scale? How can they be the basis for international trade? What is meant by the "new international economies of scale"?

5. What is meant by product differentiation? Why does this result in imperfect competition? How can international trade be based on product differentiation?

6. How can intra-industry trade be measured? What are the shortcomings of such a measure?

7. What do we mean by monopolistic competition? Why do we use this model to examine intra-industry trade?

8. Why is it that the greater the number of firms is in a monopolistically competitive industry the lower the price is, but the higher the average cost of each firm is for a given level of output?

9. Why is the price lower and the number of firms greater with the larger market size with trade in a monopolistically competitive industry?

10. How can international trade take place according to the technological gap model? What criticisms are leveled against this model? What does the product cycle model postulate? What are the various stages in a product life cycle?

11. What is the relationship between the H–O theory and other trade theories?

12. What is the empirical relevance of the H–O theory and the new trade theories? What is the relationship between transportation costs and nontraded goods and services? How do transportation costs affect the H–O theorem? How do they affect the factor-price equalization theorem?

13. What is meant by resource-oriented industries? market-oriented industries? footloose industries? What determines the classification of the industry? How does this affect the pattern of international trade?

14. How do different environmental standards affect industry location and international trade?

PROBLEMS

***1.** Draw a figure similar to Figure 6.1, showing how mutually beneficial trade can take place between two nations based on economies of scale if the nations have identical production frontiers but different tastes.

2. Do the same as in Problem 1 for two nations that have equal tastes but different production frontiers.

3. Do the same as in Problem 1 for two nations with different production frontiers and tastes.

4. Find the degree of intra-industry trade if exports and imports are, respectively

(a) 1,000 and 1,000

(b) 1,000 and 750

(c) 1,000 and 500

(d) 1,000 and 25

(e) 1,000 and 0

5. Do the same as in Problem 4, but interchange the values of exports and imports.

*6. Using the same *AC* and *MC* curves as in Figure 6.2, draw a figure similar to Figure 6.2 but showing that the firm can earn a profit before other firms imitate its product and reduce its market share.

7. (a) In what way does monopolistic competition resemble monopoly?

(b) How is it different?

(c) Why is the difference between monopolistic competition and monopoly important for consumer welfare in our intra-industry trade model?

8. How do the demand curves facing a perfectly competitive firm, a monopolistically competitive firm, and a monopolist firm differ from one another? Why?

9. What would happen if the *C* curve had shifted down only half as much as curve C' in Figure 6.3?

10. Draw a figure showing the exports of the innovating and of the imitating country during the various stages of the product cycle.

11. Indicate how increased pirating or production and sale of counterfeit American goods without paying royalties by foreign producers might affect the product cycle in the United States.

12. Show how transportation costs can be analyzed with production frontiers. (*Hint*: Relative commodity prices with trade will differ by the cost of transportation.)

13. Do the same as in Problem 12 with offer curves.

*14. Draw a figure similar to Figure 6.5, showing that transport costs fall more heavily on the nation with the steeper demand and supply curves for the traded commodity.

*= Answer is provided at www.wiley.com/college/salvatore.

APPENDIX

In this appendix, we examine external economies and their effect on the pattern of trade in Section A6.1 and then go on to deal with dynamic external economies and learning curves in Section A6.2.

A6.1 External Economies and the Pattern of Trade

In Section 6.3, we defined *external economies* as the reduction in each firm's average costs of production as the *industry's* output expands. This is to be distinguished from internal economies or increasing returns to scale, which refer to the reduction in a firm's average cost of production as the *firm's* output expands. External economies arise because a larger and more geographically concentrated industry is likely to provide more specialized labor and other services, thus leading to higher productivity and lower average costs for all the firms in the industry. This is the reason that so many computer companies are clustered in California's Silicon Valley and financial institutions and banks are concentrated in New York City.

Since external economies depend on the expansion in the number of firms in the industry rather than on the size of individual firms, they are entirely consistent with perfect competition. That is, with external economies, firms enjoy lower average costs of production because the industry rather than the firm is very large. With economies or increasing returns to scale, on the other hand, the expansion in the size of one or a few firms in the industry leads to monopoly or oligopoly, and hence to the breakdown of perfect competition.

External economies also affect the pattern of international trade. Specifically, the nation where a given industry is larger is likely to have lower average costs of production (i.e., greater external economies) and thus to be the exporter of the commodity. The nation in which an industry is first established or becomes larger may be a purely historical accident. Once an industry is established or has grown larger in one nation than in another, however, the first nation is likely to gain an even greater cost advantage over the second nation over time. That is, its advantage becomes cumulative over time. Even if Nation 2 could then have become the lower-cost producer (if its industry output were to grow as large as that of Nation 1), with Nation 1 already producing and exporting the commodity, this may not be possible. Thus, we cannot determine the pattern of trade in the presence of significant external economies. This is shown in Figure 6.6.

In Figure 6.6, D_w refers to the world demand curve for a commodity. The commodity could be produced either by Nation 1 (with average cost curve AC_1) or by Nation 2 (with average cost curve AC_2). The average cost of producing the commodity is lower for larger *industry* outputs in each nation because of external economies. Competition among the firms

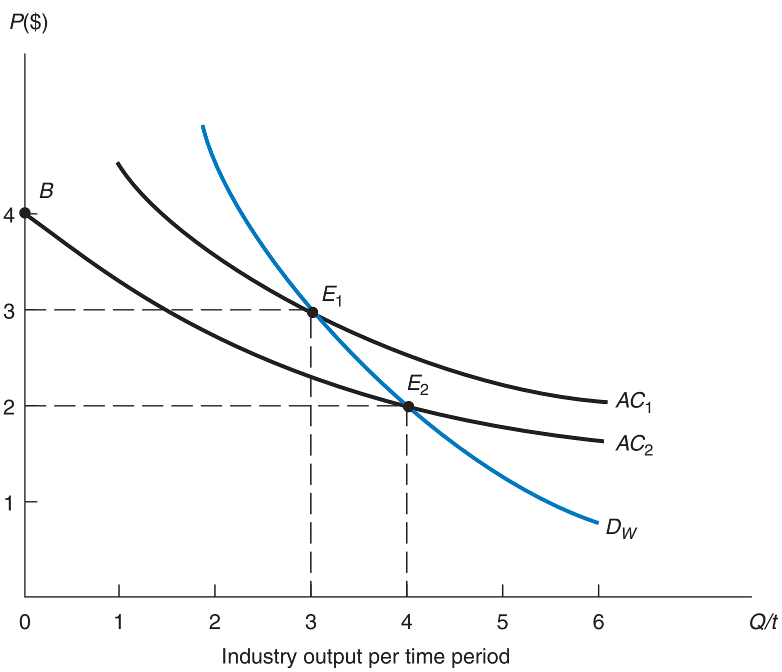

FIGURE 6.6. External Economies and Specialization.
D_w refers to the world demand curve for a commodity. The AC_1 and AC_2 curves are downward sloping because of external economies. If Nation 1 were the sole supplier of the commodity, it would produce three units of the commodity at $AC = P = \$3$ (point E_1). On the other hand, if Nation 2 were the sole supplier, it would produce four units of the commodity at $AC = P = \$2$ (point E_2). $P = AC$ in either case because of perfect competition. If the industry did not exist in Nation 2, Nation 2 would not start producing the commodity because its average cost at the beginning would be higher (point B) than in Nation 1 when the latter is already in the market (point E_1).

in the industry would also lead to a price *(P)* equal to the average cost of production *(AC)* in either country.

Suppose that because of some historical accident or other reason, the industry is already established in Nation 1 but not in Nation 2. Then Nation 1 would supply the world market by producing three units of the commodity at $AC = P = \$3$ (point E_1 in the figure). Nation 2, however, could supply four units of the commodity at $AC = P = \$2$ (point E_2 in the figure). With Nation 1 already in the market, however, Nation 2 cannot enter the market. Specifically, Nation 2 would face $AC = \$4$ (point B in the figure) to begin producing the commodity. Since this is higher than the price at which Nation 1 already supplies the commodity to the world market, Nation 2 will not produce the commodity. Thus, with large external economies, the pattern of trade cannot be determined on the basis of lower actual or potential average costs.

Problem Draw a figure showing external economies for a single firm.

A6.2 Dynamic External Economies and Specialization

As firms gain experience in production, they often make improvements in their product or in their production techniques. As other firms then imitate the innovating firms, average costs of production fall for the entire industry. This decline in the average cost of production as the *cumulative* output of the industry increases and firms accumulate knowledge over time is called dynamic external economies. While the simple external economies discussed before arise when the industry output *per time period* increases, dynamic external economies arise as the cumulative output of the industry increases and firms accumulate knowledge *over time*. For example, it might take 1,000 hours to assemble the 100th aircraft, but only 700 hours to assemble the 200th aircraft because as managers and workers gain production experience they become more efficient. Real-world experience shows that average costs decline by 20 to 30 percent for each doubling of cumulative output for many industries.

Dynamic external economies can be shown graphically by learning curves. A learning curve shows the degree by which average costs of production decline as the cumulative industry output increases over time. For example, Figure 6.7 shows that the average cost of production for the industry in Nation 1 is \$2.50 when output is 200 units (point F on L_1), \$2.00 when the cumulative output doubles to 400 units (point C), and \$1.60 when cumulative output has doubled again to 800 units (point H).

Figure 6.7 also shows that Nation 2 could produce 400 units of the product at a cost of \$1.50 per unit (point G on L_2), but since it faces the higher startup cost of \$3 per unit (point J), it may not enter the market. The only way for Nation 2 to enter the market is for its government to provide temporary trade protection or subsidies to the industry while it grows and accumulates knowledge. This is called the infant industry argument. It is extremely difficult, however, to pick winners (i.e., to pick industries that will grow into adulthood and become able to compete freely in the world market in a reasonable period of time). More will be said on this when we discuss trade policies in Section 9.4B.

Problem The equation of the learning curve can be expressed as $AC = aQ^b$. Explain the meaning of each parameter and whether it needs to assume a positive or negative value to obtain a learning curve.

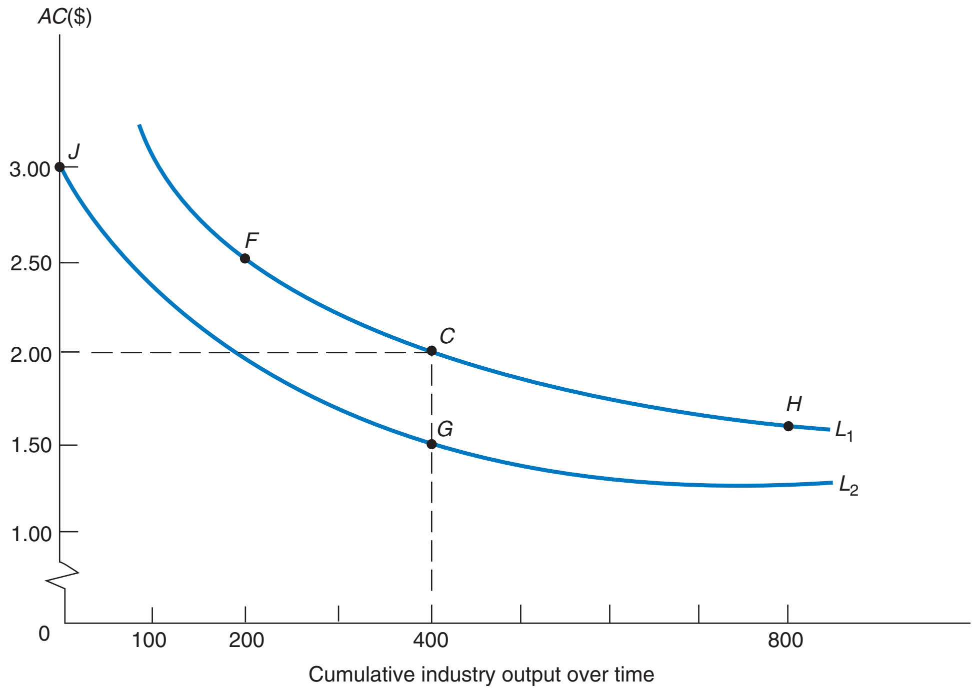

FIGURE 6.7. The Learning Curve and Specialization.
The figure shows that the average cost of production for the industry in Nation 1 is $2.50 when output is 200 units (point F on L_1), $2.00 when the cumulative output doubles to 400 units (point C), and $1.60 when cumulative output has doubled again to 800 units (point H). The figure also shows that Nation 2 could produce 400 units of the product at a cost of $1.50 per unit (point G on L_2), but since it faces the higher startup cost of $3 per unit (point J), it may not enter the market.

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INTERNet

Trade statistics that can be used to measure inter- and intra-industry trade are provided by the U.S. Census Bureau at:

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A great deal of trade statistics for the United States by country and region can be found through the home page of the U.S. Department of Commerce, International Trade Administration at:

http://www.ita.doc.gov/td/industry/otea

International trade statistics by country and product group are available from the International Trade Center (ITC) by selecting "Countries" and then "Trade Statistics Aggregates" at:

http://www.intracen.org/trade-support/trade-statistics

Trade Statistics for European countries are provided by EuroStat (Statistical Office of the European Communities) at:

http://ec.europa.eu/trade

Data on the international competitiveness of nations are available from the Institute of Management Development and the World Economic Forum at:

http://www.imd.ch/wcy

http://www.weforun.org

For the environmental sustainability and performance indexes, see:

http://sedac.ciesin.columbia.edu/es/esi

http://epi.yale.edu/epi2012/rankings

Economic Growth and International Trade

chapter 7

LEARNING GOALS:

After reading this chapter, you should be able to:

- **Explain how the change in a nation's factor endowments affects its growth, terms of trade, volume of trade, and welfare**
- **Explain how technological change affects growth, trade, and welfare**
- **Understand how a change in tastes affects trade, growth, and welfare**

7.1 Introduction

Aside from trade based on technological gaps and product cycles (discussed in Section 6.5), which is dynamic in nature, the trade theory discussed thus far is completely static in nature. That is, given the nation's factor endowments, technology, and tastes, we proceeded to determine the nation's comparative advantage and the gains from trade. However, factor endowments change over time; technology usually improves; and tastes may also change. As a result, the nation's comparative advantage also changes over time.

In this chapter, we extend our trade model to incorporate these changes. We show how a change in factor endowments and/or an improvement in technology affect the nation's production frontier. These changes, together with possible changes in tastes, affect the nation's offer curve, the volume and the terms of trade, and the gains from trade.

In Section 7.2, we illustrate the effect of a change in factor endowments on the nation's production frontier and examine the Rybczynski theorem. In Section 7.3, we define the different types of technical progress and illustrate their effect on the nation's production frontier. Section 7.4 deals with and illustrates the effect of growth on trade and welfare in a nation that is too small to affect the terms of trade. Section 7.5 extends the analysis to the more complex case of the large nation. Finally, Section 7.6 examines the effect of growth and changes in tastes in both nations on the volume and terms of trade. The appendix presents the formal proof of the Rybcynski theorem, examines growth when one factor is not mobile within the nation, and gives a graphical presentation of Hicksian technical progress.

Throughout this chapter and in the appendix, we will have the opportunity to utilize most of the tools of analysis developed in previous chapters and truly see trade theory at work. The type of analysis that we will be performing is known as **comparative statics** (as opposed to **dynamic analysis**). *Comparative statics* analyzes the effect on the equilibrium position resulting from a change in underlying economic conditions and without regard to the transitional period and process of adjustment. *Dynamic analysis*, on the other hand, deals with the time path and the process of adjustment itself. Dynamic trade theory is still in its infancy. However, our comparative statics analysis can carry us a long way in analyzing the effect on international trade resulting from changes in factor endowments, technology, and tastes over time.

7.2 Growth of Factors of Production

Through time, a nation's population usually grows and with it the size of its labor force. Similarly, by utilizing part of its resources to produce capital equipment, the nation increases its stock of capital. *Capital* refers to all the human-made means of production, such as machinery, factories, office buildings, transportation, and communications, as well as to the education and training of the labor force, all of which greatly enhance the nation's ability to produce goods and services.

Although there are many different types of labor and capital, we will assume for simplicity that all units of labor and capital are homogeneous (i.e., identical), as we have done in previous chapters. This will leave us with two factors—labor (L) and capital (K)—so that we can conveniently continue to use plane geometry for our analysis. In the real world, of course, there are also natural resources, and these can be depleted (such as minerals) or new ones found through discoveries or new applications.

We will also continue to assume that the nation experiencing growth is producing two commodities (commodity X, which is L intensive, and commodity Y, which is K intensive) under constant returns to scale.

7.2A Labor Growth and Capital Accumulation over Time

An increase in the endowment of labor and capital over time causes the nation's production frontier to shift outward. The type and degree of the shift depend on the rate at which L and K grow. If L and K grow at the same rate, the nation's production frontier will shift out evenly in all directions at the rate of factor growth. As a result, the slope of the old and new production frontiers (before and after factor growth) will be the same at any point where they are cut by a ray from the origin. This is the case of **balanced growth**.

If only the endowment of L grows, the output of both commodities grows because L is used in the production of both commodities and L can be substituted for K to some extent in the production of both commodities. However, the output of commodity X (the L-intensive commodity) grows faster than the output of commodity Y (the K-intensive commodity). The opposite is true if only the endowment of K grows. If L and K grow at different rates, the outward shift in the nation's production frontier can similarly be determined.

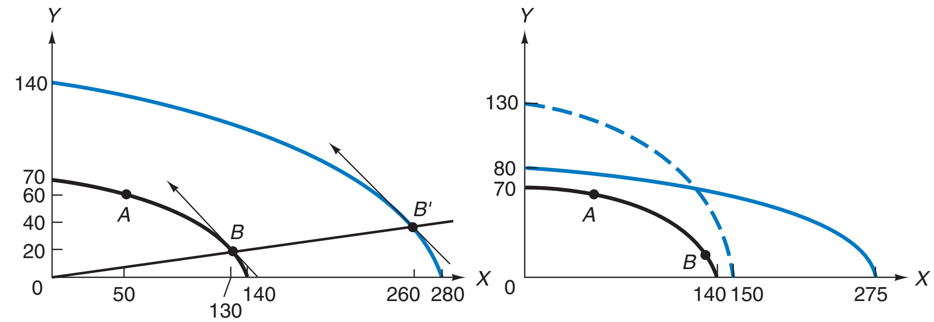

FIGURE 7.1. Growth of Labor and Capital over Time.
The left panel shows the case of balanced growth with L and K doubling under constant returns to scale. The two production frontiers have identical shapes and the same slope, or P_X/P_Y, along any ray from the origin. The right panel shows the case when only L or only K doubles. When only L doubles, the output of commodity X (the L-intensive commodity) grows proportionately more than the output of Y (but less than doubles). Similarly, when only K doubles, the output of Y grows proportionately more than that of X but less than doubles (see the dashed production frontier).

Figure 7.1 shows various types of hypothetical factor growth in Nation 1. (The growth of factors and endowments is exaggerated to make the illustrations clearer.) The presentation is completely analogous for Nation 2 and will be left as an end-of-chapter problem.

The left panel of Figure 7.1 shows the case of balanced growth under the assumption that the amounts of L and K available to Nation 1 double. With constant returns to scale, the maximum amount of each commodity that Nation 1 can produce also doubles, from 140X to 280X or from 70Y to 140Y. Note that the shape of the expanded production frontier is identical to the shape of the production frontier before growth, so that the slope of the two production frontiers, or P_X/P_Y, is the same at such points as B and B', where they are cut by a ray from the origin.

The right panel repeats Nation 1's production frontier before growth (with intercepts of 140X and 70Y) and shows two additional production frontiers—one with only L doubling (solid line) and the other with only K doubling (dashed line). When only L doubles, the production frontier shifts more along the X-axis, measuring the L-intensive commodity. If only K doubles, the production frontier shifts more along the Y-axis, measuring the K-intensive commodity. Note that when only L doubles, the maximum output of commodity X does not double (i.e., it only rises from 140X to 275X). For X to double, *both* L and K must double. Similarly, when only K doubles, the maximum output of commodity Y less than doubles (from 70Y to 130Y).

When both L and K grow at the same rate and we have constant returns to scale in the production of both commodities, the productivity, and therefore the returns of L and K, remain the same after growth as they were before growth took place. If the dependency rate (i.e., the ratio of dependents to the total population) also remains unchanged, real per capita income and the welfare of the nation tend to remain unchanged. If only L grows (or L grows proportionately more than K), K/L will fall and so will the productivity of L, the returns to L, and real per capita income. If, on the other hand, only the endowment of K grows (or K grows proportionately more than L), K/L will rise and so will the productivity of L, the returns to L, and real per capita income.

7.2B The Rybczynski Theorem

The **Rybczynski theorem** postulates that at constant commodity prices, an increase in the endowment of one factor will increase by a greater proportion the output of the commodity intensive in that factor and will reduce the output of the other commodity. For example, if only L grows in Nation 1, then the output of commodity X (the L-intensive commodity) expands more than proportionately, while the output of commodity Y (the K-intensive commodity) declines at constant P_X and P_Y.

Figure 7.2 shows the production frontier of Nation 1 before and after only L doubles (as in the right panel of Figure 7.1). With trade but before growth, Nation 1 produces at point B (i.e., 130X and 20Y) at $P_X/P_Y = P_B = 1$, as in previous chapters. After only L doubles and with P_X/P_Y remaining at $P_B = 1$, Nation 1 would produce at point M on its new and expanded production frontier. At point M, Nation 1 produces 270X but only 10Y. Thus, the output of commodity X more than doubled, while the output of commodity Y declined (as predicted by the Rybczynski theorem). Doubling L and transferring some L and K from the production of commodity Y more than doubles the output of commodity X.

The formal graphical proof of the Rybczynski theorem will be presented in the appendix. Here we will give intuitive but still adequate proof of the theorem. The proof is as follows. For *commodity* prices to remain constant with the growth of one factor, *factor* prices (i.e., w and r) must also remain constant. But factor prices can remain constant only if K/L and the productivity of L and K also remain constant in the production of both commodities. The only way to fully employ all of the increase in L and still leave K/L unchanged in the production of both commodities is for the output of commodity Y (the K-intensive commodity) to fall in order to release enough K (and a little L) to absorb all of the increase in L in the production of commodity X (the L-intensive commodity). Thus, the output of commodity X rises while the output of commodity Y declines at constant commodity prices.

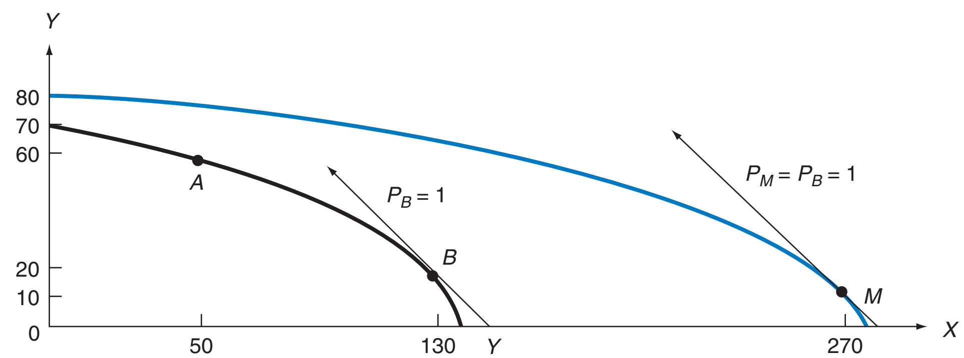

FIGURE 7.2. The Growth of Labor Only and the Rybczynski Theorem.
With trade but before growth, Nation 1 produces at point B (130X and 20Y) at $P_X/P_Y = P_B = 1$, as in previous chapters. After only L doubles and with P_X/P_Y remaining at $P_B = 1$, Nation 1 produces at point M (270X and 10Y) on its new and expanded production frontier. Thus, the output of X (the L-intensive commodity) expanded, and the output of Y (the K-intensive commodity) declined, as postulated by the Rybczynski theorem.

In fact, the increase in the output of commodity X expands by a greater proportion than the expansion in the amount of labor because some labor and capital are also transferred from the production of commodity Y to the production of commodity X. This is called the *magnification effect* and is formally proved in Section A7.1 of the appendix.

To summarize, we can say that for P_X and P_Y (and therefore P_X/P_Y) to remain the same, w and r must be constant. But w and r can remain the same only if K/L remains constant in the production of both commodities. The only way for this to occur and also absorb all of the increase in L is to reduce the output of Y so as to release K/L in the greater proportion used in Y, and combine the released K with the additional L at the lower K/L used in the production of X. Thus, the output of X rises and that of Y falls. In fact, the output of X increases by a greater proportion than the increase in L. Similarly, when only K increases, the output of Y rises more than proportionately and that of X falls.

If one of the factors of production is not mobile within the nation, the results differ and depend on whether it is the growing or the nongrowing factor that is immobile. This is examined in Section A7.2 of the appendix using the specific-factors model introduced in the appendix to Chapter 5 (Section A5.4).

7.3 Technical Progress

Several empirical studies have indicated that most of the increase in real per capita income in industrial nations is due to technical progress and much less to capital accumulation. However, the analysis of technical progress is much more complex than the analysis of factor growth because there are several definitions and types of technical progress, and they can take place at different rates in the production of either or both commodities.

For our purposes, the most appropriate definitions of *technical progress* are those advanced by *John Hicks*, the British economist who shared the 1972 Nobel Prize in economics. In Section 7.3A, we define the different types of Hicksian technical progress. In Section 7.3B, we then examine the effect that the different types of Hicksian technical progress have on the nation's production frontier. Throughout our discussion, we will assume that constant returns to scale prevail before and after technical progress takes place and that technical progress occurs in a once-and-for-all fashion.

7.3A Neutral, Labor-Saving, and Capital-Saving Technical Progress

Technical progress is usually classified into neutral, labor saving, or capital saving. All technical progress (regardless of its type) reduces the amount of both labor and capital required to produce any given level of output. The different types of Hicksian technical progress specify how this takes place.

Neutral technical progress increases the productivity of L and K in the same proportion, so that K/L remains the same after the neutral technical progress as it was before *at unchanged relative factor prices (w/r)*. That is, with unchanged w/r, there is no substitution of L for K (or vice versa) in production so that K/L remains unchanged. All that happens is that a given output can now be produced with less L and less K.

Labor-saving technical progress increases the productivity of K proportionately more than the productivity of L. As a result, K is substituted for L in production and K/L rises at unchanged w/r. Since more K is used per unit of L, this type of technical progress is called labor saving. Note that a given output can now be produced with fewer units of L and K but with a higher K/L.

Capital-saving technical progress increases the productivity of L proportionately more than the productivity of K. As a result, L is substituted for K in production and L/K rises (K/L falls) at unchanged w/r. Since more L is used per unit of K, this type of technical progress is called capital saving. Note that a given output can now be produced with fewer units of L and K but with a higher L/K (a lower K/L).

The appendix to this chapter gives a rigorous graphical interpretation of the Hicksian definitions of technical progress, utilizing somewhat more advanced tools of analysis.

7.3B Technical Progress and the Nation's Production Frontier

As in the case of factor growth, all types of technical progress cause the nation's production frontier to shift outward. The type and degree of the shift depend on the type and rate of technical progress in either or both commodities. Here we will deal only with neutral technical progress. Nonneutral technical progress is extremely complex and can only be handled mathematically in the most advanced graduate texts.

With the same rate of neutral technical progress in the production of both commodities, the nation's production frontier will shift out evenly in all directions at the same rate at which technical progress takes place. This has the same effect on the nation's production frontier as balanced factor growth. Thus, the slope of the nation's old and new production frontiers (before and after this type of technical progress) will be the same at any point where they are cut by a ray from the origin.

For example, suppose that the productivity of L and K doubles in the production of commodity X and commodity Y in Nation 1 and constant returns to scale prevail in the production of both commodities. The graph for this type of technical progress is identical to the left panel of Figure 7.1, where the supply of both L and K doubled, and so the graph is not repeated here.

Figure 7.3 shows Nation 1's production frontier before technical progress and after the productivity of L and K doubled in the production of commodity X only, or in the production of commodity Y only (the dashed production frontier).

When the productivity of L and K doubles in the production of commodity X only, the output of X doubles for each output level of commodity Y. For example, at the unchanged output of 60Y, the output of commodity X rises from 50X before technical progress to 100X afterward (points A and A', respectively, in the figure). Similarly, at the unchanged output of 20Y, the output of commodity X increases from 130X to 260X (points B and B'). When all of Nation 1's resources are used in the production of commodity X, the output of X also doubles (from 140X to 280X). Note that the output of commodity Y remains unchanged at 70Y if all of the nation's resources are used in the production of commodity Y and technical progress took place in the production of commodity X only.

Analogous reasoning explains the shift in the production frontier when the productivity of L and K doubles only in the production of commodity Y (the dashed production frontier

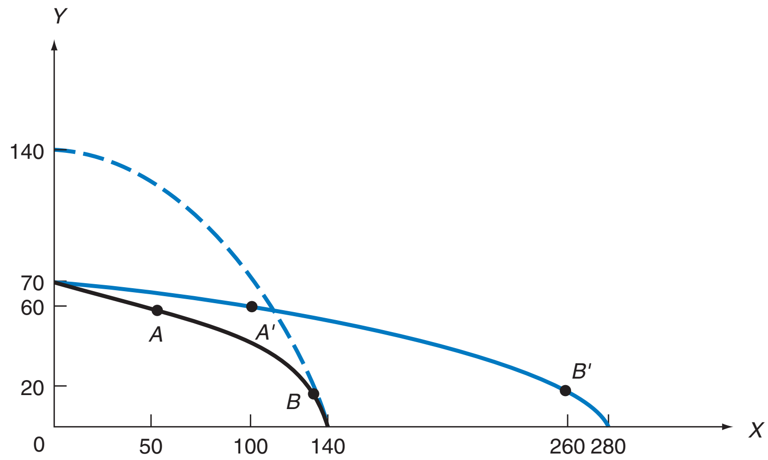

FIGURE 7.3. Neutral Technical Progress.
The figure shows Nation 1's production frontier before technical progress and after the productivity of *L* and *K* doubled in the production of commodity X only, or in the production of commodity Y only (the dashed frontier). Note that if Nation 1 uses all of its resources in the production of the commodity in which the productivity of *L* and *K* doubled, the output of the commodity also doubles. On the other hand, if Nation 1 uses all of its resources in the production of the commodity in which no technical progress occurred, the output of that commodity remains unchanged.

in Figure 7.3). The student should carefully examine the difference between Figure 7.3 and the right panel of Figure 7.1.

Finally, it must be pointed out that, in the absence of trade, all types of technical progress tend to increase the nation's welfare. The reason is that with a higher production frontier and the same *L* and population, each citizen could be made better off after growth than before by an appropriate redistribution policy. The question of the effect of growth on trade and welfare will be explored in the remainder of the chapter. Case Study 7-1 examines the growth over time in the capital stock per worker of selected countries.

CASE STUDY 7-1 Growth in the Capital Stock per Worker of Selected Countries

Table 7.1 gives the growth from 1979 to 1997 and 2006 in the capital stock per worker (measured in terms of 1990 international dollar prices) in the nations included in Table 5.2 in Case Study 5-2. Table 7.1 shows that from 1979 (the first year for which such comparable data are available) to 2006 the stock of capital per worker grew at a faster rate in Canada and the United States than in the other developed countries listed. It grew in China much faster than in the other developing countries listed.

From Table 7.1, we can conclude that from 1979 to 2006 the U.S. *comparative disadvantage* in capital-intensive products increased somewhat with respect to Canada but decreased with respect to the other countries. On the other hand, during the same period the U.S. *comparative advantage* in capital-intensive products decreased sharply with respect to all the developing countries, except Mexico.

(continued)

■ CASE STUDY 7-1 Continued

■ TABLE 7.1. Changes in Capital-Labor Ratios of Selected Countries, 1979, 1997, and 2006 (in 1990 International Dollar Prices)

Country	1979	1997	2006	2006/1979
Japan	$64,218	$77,429	$111,615	1.74
Canada	45,294	61,274	89,652	1.98
Germany	50,487	61,673	87,400	1.73
France	53,901	59,602	85,097	1.58
Italy	43,878	48,943	73,966	1.69
United States	40,366	50,233	73,282	1.82
Spain	29,384	38,897	51,814	1.76
United Kingdom	27,041	30,226	44,545	1.65
Korea	13,002	26,635	45,235	3.48
Mexico	13,681	14,030	23,921	1.75
Turkey	8,976	10,780	20,478	2.28
Brazil	5,807	13,940	16,650	2.87
Russia	5,728	6,246	16,131	2.82
Thailand	3,144	8,106	11,688	3.72
China	1,114	3,219	7,485	6.72
India	2,135	3,094	5,870	2.75

Source: For 1979 and 1997, author's calculation on preliminary results from Penn World Table Version 5.7 (October 2000) and 6.1 (October 2002). For 2006, author's calculations following the Penn World Tables.

7.4 Growth and Trade: The Small-Country Case

We will now build on the discussion of the previous two sections and analyze the effect of growth on production, consumption, trade, and welfare when the nation is too small to affect the relative commodity prices at which it trades (so that the nation's terms of trade remain constant). In Section 7.4A, we discuss growth in general and define protrade, antitrade, and neutral production and consumption. Using these definitions, we illustrate the effect of one type of factor growth in Section 7.4B and analyze the effect of technical progress in Section 7.4C. Section 7.5 then examines the more realistic case where the nation *does* affect relative commodity prices by its trading.

7.4A The Effect of Growth on Trade

We have seen so far that factor growth and technical progress result in an outward shift in the nation's production frontier. What happens to the volume of trade depends on the rates at which the output of the nation's exportable and importable commodities grow and on the consumption pattern of the nation as its national income expands through growth and trade.

If the output of the nation's exportable commodity grows proportionately more than the output of its importable commodity at constant relative commodity prices, then growth tends to lead to greater than proportionate expansion of trade and is said to be **protrade**. Otherwise, it is **antitrade** or **neutral**. The expansion of output has a neutral trade effect if it leads to the same rate of expansion of trade. On the other hand, if the nation's consumption of its importable commodity increases proportionately more than the nation's consumption of its exportable commodity at constant prices, then the consumption effect tends to lead to a greater than proportionate expansion of trade and is said to be protrade. Otherwise, the expansion in consumption is antitrade or neutral.

Thus, production and consumption can be protrade (if they lead to a greater than proportionate increase in trade at constant relative commodity prices), antitrade, or neutral. *Production is protrade* if the output of the nation's *exportable commodity increases proportionately more* than the output of its importable commodity. *Consumption is protrade* if the nation's consumption of its *importable commodity increases proportionately more* than consumption of its exportable commodity.

What in fact happens to the volume of trade in the process of growth depends on the net result of these production and consumption effects. If both production and consumption are protrade, the volume of trade expands proportionately faster than output. If production and consumption are both antitrade, the volume of trade expands proportionately less than output and may even decline absolutely. If production is protrade and consumption antitrade or vice versa, what happens to the volume of trade depends on the net effect of these two opposing forces. In the unlikely event that both production and consumption are neutral, trade expands at the same rate as output.

Since growth can result from different types and rates of factor growth and technical progress, and production and consumption can be protrade, antitrade, or neutral, the effect of growth on trade and welfare will vary from case to case. Thus, the approach must necessarily be taxonomic (i.e., in the form of "if this is the case, then this is the outcome"). As a result, all we can do is give some examples and indicate the forces that must be analyzed to determine what is likely to happen in any particular situation.

7.4B Illustration of Factor Growth, Trade, and Welfare

The top panel of Figure 7.4 reproduces Figure 7.2, which shows that L doubles in Nation 1 and that Nation 1's terms of trade do not change with growth and trade. That is, before growth, Nation 1 produced at point B, traded 60X for 60Y at $P_B = 1$, and reached indifference curve *III* (as in previous chapters). When L doubles in Nation 1, its production frontier shifts outward as explained in Section 7.2A. If Nation 1 is too small to affect relative commodity prices, it will produce at point M, where the new expanded production frontier is tangent to $P_M = P_B = 1$. At point M, Nation 1 produces more than twice as much of commodity X than at point B but less of commodity Y, as postulated by the Rybczynski theorem. At $P_M = P_B = 1$, Nation 1 exchanges 150X for 150Y and consumes at point Z on its community indifference curve VII.

Since the output of commodity X (Nation 1's exportable commodity) increased while the output of commodity Y declined, the growth of output is protrade. Similarly, since the consumption of commodity Y (Nation 1's importable commodity) increased proportionately more than the consumption of commodity X (i.e., point Z is to the left of a ray from the origin through point E), the growth of consumption is also protrade. With both production and consumption protrade, the volume of trade expanded proportionately more than the output of commodity X.

Note that with growth and trade, Nation 1's *consumption* frontier is given by straight line P_M tangent to the new expanded production frontier at point M. The fact that consumption of both commodities increased with growth and trade means that both commodities are

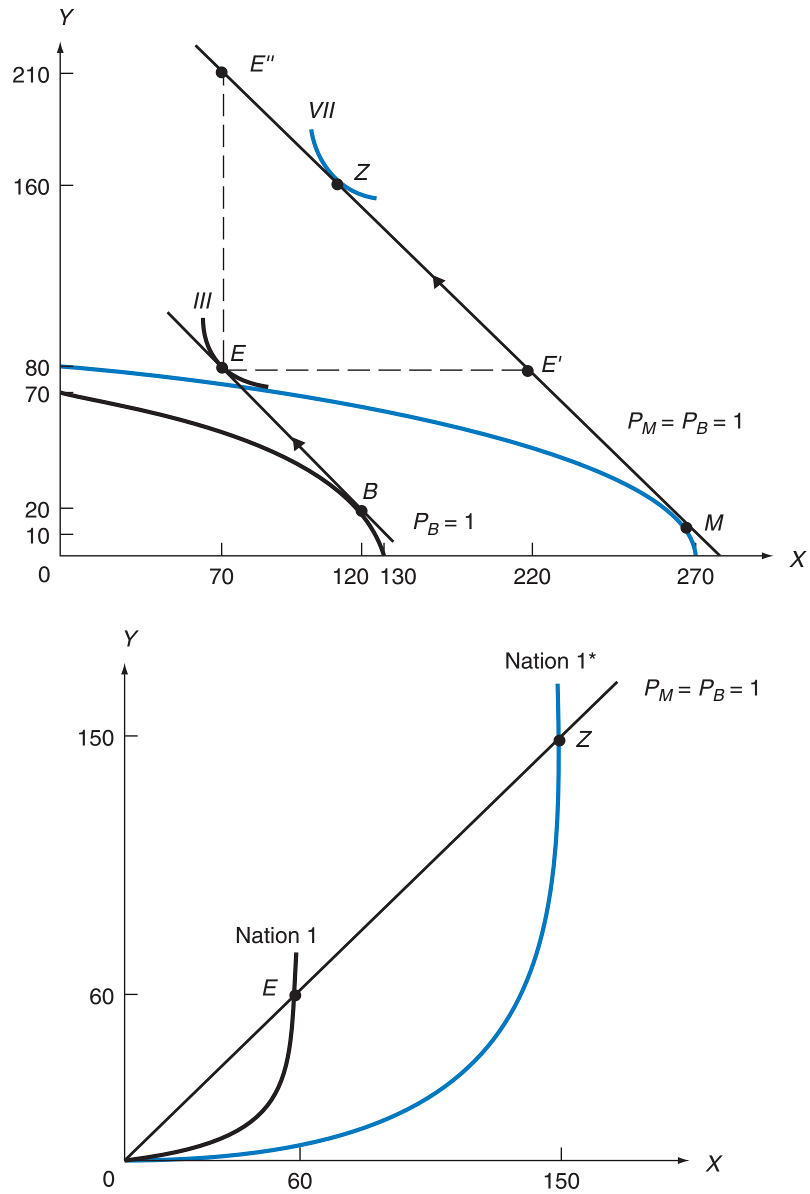

FIGURE 7.4. Factor Growth and Trade: The Small-Country Case.
The top panel shows that after L doubles, Nation 1 exchanges 150X for 150Y at $P_M = P_B = 1$ and reaches indifference curve *VII*. Since the consumption of both X and Y rises with growth, both commodities are normal goods. Since L doubled but consumption less than doubled (compare point Z to point E), the social welfare of Nation 1 declined. The bottom panel shows that with free trade before growth, Nation 1 exchanged 60X for 60Y at $P_X/P_Y = P_B = 1$. With free trade after growth, Nation 1 exchange 150X for 150Y at $P_X/P_Y = P_B = 1$.

normal goods. Only if commodity Y had been an **inferior good** would Nation 1 have consumed a smaller absolute amount of Y (i.e., to the right and below point E' on line P_M). Similarly, Nation 1 would have consumed a smaller absolute amount of commodity X (i.e., to the left and above point E'') only if commodity X had been an inferior good.

The bottom panel of Figure 7.4 utilizes offer curves to show the same growth of trade for Nation 1 at constant terms of trade. That is, with free trade before growth, Nation 1 exchanged 60X for 60Y at $P_X/P_Y = P_B = 1$. With free trade after growth, Nation 1 exchanged 150X for 150Y at $P_X/P_Y = P_M = P_B = 1$. The straight line showing the constant terms of trade also represents the straight-line segment of Nation 2's (or the rest of the world's) offer curve. It is because Nation 1 is very small that its offer curve before and after growth intersects the straight-line segment of Nation 2's (the large nation's) offer curve and the terms of trade remain constant.

Note that Nation 1 is worse off after growth because its labor force (and population) doubled while its total consumption less than doubled (compare point Z with 120X and 160Y after growth to point E with 70X and 80Y before growth). Thus, the consumption and welfare of Nation 1's "representative" citizen decline as a result of this type of growth. A representative citizen is one with the identical tastes and consumption pattern of the nation as a whole but with quantities scaled down by the total number of citizens in the nation.

7.4C Technical Progress, Trade, and Welfare

We have seen in Section 7.3B that *neutral technical progress at the same rate in the production of both commodities* leads to a proportionate expansion in the output of both commodities at constant relative commodity prices. If consumption of each commodity also increases proportionately in the nation, the volume of trade will increase at the same rate at constant terms of trade. That is, the neutral expansion of production and consumption leads to the same rate of expansion of trade. With neutral production and protrade consumption, the volume of trade would expand proportionately more than production. With neutral production and antitrade consumption, the volume of trade would expand proportionately less than production. However, regardless of what happens to the volume of trade, the welfare of the representative citizen will increase with constant L and population and constant terms of trade.

Neutral technical progress in the production of the exportable commodity only is protrade. For example, if neutral technical progress takes place only in the production of commodity X in Nation 1, then Nation 1's production frontier expands only along the X-axis, as indicated in Figure 7.3. At constant terms of trade, Nation 1's output of commodity X will increase even more than in Figure 7.4, while the output of commodity Y declines (as in Figure 7.4). Nation 1 will reach an indifference curve higher than *VII*, and the volume of trade will expand even more than in Figure 7.4. What is even more important is that with a constant population and labor force, the welfare of the representative citizen now rises (as opposed to the case where only L grows in Figure 7.4).

On the other hand, *neutral technical progress only in the production of commodity Y* (the importable commodity) *is antitrade*, and Nation 1's production frontier will expand only along the Y-axis (the dashed production frontier in Figure 7.3). If the terms of trade, tastes, and population also remain unchanged, the volume of trade tends to decline, but national welfare increases. This is similar to the growth of K only in Nation 1 and will be examined in Section 7.5c. The case where neutral technical change occurs at different rates in the two commodities may lead to a rise or fall in the volume of trade but always increases welfare. The same is generally true for nonneutral technical progress. Thus, technical progress, depending on the type, may increase or decrease trade, but it will always increase social welfare in a small nation. Case Study 7-2 examines the growth of labor

CASE STUDY 7-2 Growth in Output per Worker from Capital Deepening, Technological Change, and Improvements in Efficiency

Table 7.2 gives the growth of output per worker from 1965 to 1990 and the contribution to that growth made by capital deepening (i.e., the increase in capital per worker) and improvements in technology and efficiency (catching-up), for a selected group of developed and developing countries, arranged according to the size of their economy. The table shows that the growth of output per worker grew most rapidly in Korea (425 percent), followed by Japan (209 percent), and Thailand (195 percent). The United States experienced the lowest growth (31 percent) among the nations included in Table 7.2. The table also shows that most of the growth in output per worker came from capital deepening. Technology made the largest contribution to growth in France, followed by India, Japan, Germany, and Thailand. The largest contribution from improvements in efficiency occurred in Korea, Italy, and Thailand. Argentina, Chile, Mexico, Spain, and the United Kingdom actually suffered a reduction in efficiency.

TABLE 7.2. Growth in Output per Worker from Capital Deepening, Technological Change, and Improvements in Efficiency, 1965–1990

Country	Percentage Change in Output per Worker	Contribution to Percentage Change in Output per Worker of		
		Capital Deepening	Change in Technology	Change in Efficiency
United States	31.1	19.3	9.9	0.0
Japan	208.5	159.9	15.2	3.1
Germany	70.7	31.8	14.4	13.3
France	78.3	47.2	16.3	4.1
United Kingdom	60.7	64.9	1.4	−3.8
Italy	117.4	45.5	13.3	31.9
Canada	54.6	18.6	11.7	16.7
Spain	111.7	125.5	7.1	−12.3
Mexico	47.5	66.7	2.1	−13.3
India	80.5	38.9	15.7	12.4
Korea, Republic of	424.5	259.7	2.9	41.7
Argentina	4.6	59.3	1.8	−35.5
Turkey	129.3	95.6	6.6	9.9
Thailand	194.7	104.1	12.6	28.3
Philippines	43.8	20.9	7.9	10.3
Chile	16.6	50.2	1.9	−23.9

Source: S. Kumar and R. R. Russell, ''Technological Change, Technological Catch-up, and Capital Deepening: Relative Contributions to Growth and Convergence,'' *American Economic Review*, June 2002, pp. 527–548.

productivity attributable to capital accumulation and technological change in a selected group of developed and developing countries over time.

7.5 Growth and Trade: The Large-Country Case

We will now build on our presentation of Section 7.4 to analyze the effect of growth on production, consumption, trade, and welfare when the nation is sufficiently large to affect the relative commodity prices at which it trades (so that the nation's terms of trade change). In Section 7.5A, we examine the effect of growth on the nation's terms of trade and welfare. In Section 7.5B, we deal with the case where growth, by itself, might improve the nation's welfare but its terms of trade deteriorate so much as to make the nation worse off after growth than before. Finally, in Section 7.5C, we examine the case where growth leads to improvement in the country's terms of trade and welfare.

7.5A Growth and the Nation's Terms of Trade and Welfare

If growth, regardless of its source or type, expands the nation's volume of trade at constant prices, then the nation's terms of trade tend to deteriorate. Conversely, if growth reduces the nation's volume of trade at constant prices, the nation's terms of trade tend to improve. This is referred to as the **terms-of-trade effect** of growth.

The effect of growth on the nation's welfare depends on the net result of the terms-of-trade effect and a wealth effect. The **wealth effect** refers to the change in the output per worker or per person as a result of growth. A positive wealth effect, by itself, tends to increase the nation's welfare. Otherwise, the nation's welfare tends to decline or remain unchanged. If the wealth effect is positive and the nation's terms of trade improve as a result of growth and trade, the nation's welfare will definitely increase. If they are both unfavorable, the nation's welfare will definitely decline. If the wealth effect and the terms-of-trade effect move in opposite directions, the nation's welfare may deteriorate, improve, or remain unchanged depending on the relative strength of these two opposing forces.

For example, if only L doubles in Nation 1, the wealth effect, by itself, tends to reduce Nation 1's welfare. This was the case shown in Figure 7.4. Furthermore, since this type of growth tends to expand the volume of trade of Nation 1 at $P_M = P_B = 1$, Nation 1's terms of trade also tend to decline. Thus, the welfare of Nation 1 will decline for both reasons. This case is illustrated in Figure 7.5.

Figure 7.5 is identical to Figure 7.4, except that now Nation 1 is assumed to be large enough to affect relative commodity prices. With the terms of trade deteriorating from $P_M = P_B = 1$ to $P_N = ½$ with growth and trade, Nation 1 produces at point N, exchanges 140X for 70Y with Nation 2, and consumes at point T on indifference curve IV (see the top panel). Since the welfare of Nation 1 declined (i.e., the wealth effect was negative) even when it was too small to affect its terms of trade, and now its terms of trade have also deteriorated, the welfare of Nation 1 declines even more. This is reflected in indifference curve IV being lower than indifference curve VII.

The bottom panel of Figure 7.5 shows with offer curves the effect of this type of growth on the volume and the terms of trade when Nation 1 does not affect its terms of trade (as in the bottom panel of Figure 7.4) and when it does.

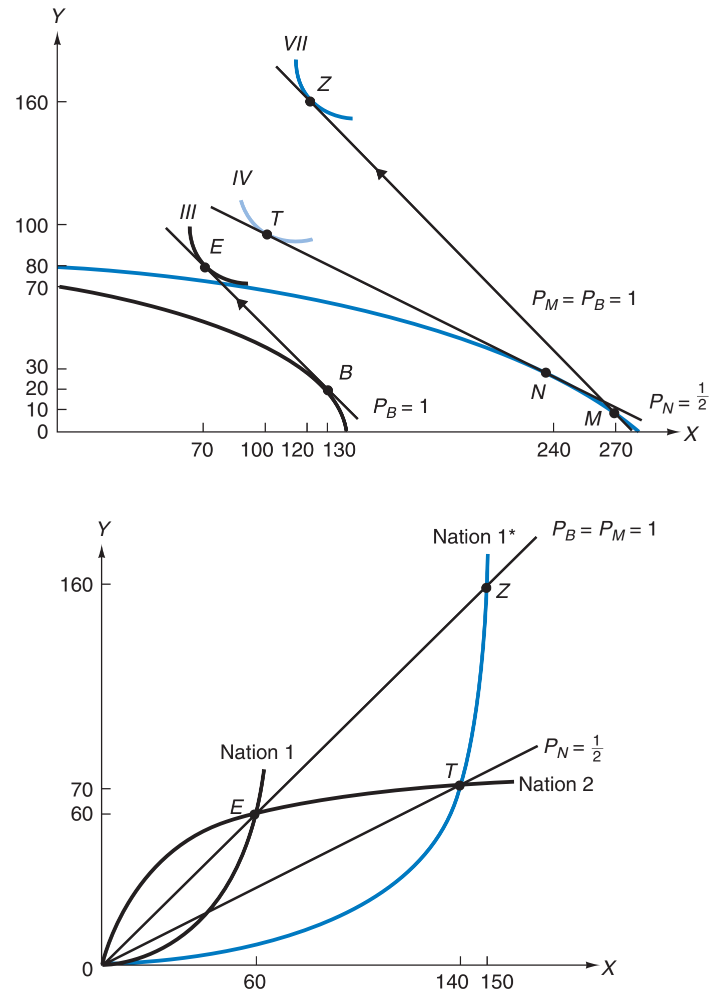

FIGURE 7.5. Growth and Trade: The Large-Country Case.
Figure 7.5 is identical to Figure 7.4, except that now Nation 1 is assumed to be large enough to affect the terms of trade. With the terms of trade deteriorating from $P_M = P_B = 1$ to $P_N = \frac{1}{2}$ with growth and trade, Nation 1 produces at point *N*, exchanges 140X for 70Y with Nation 2, and consumes at point *T* on indifference curve *IV* (see the top panel). Since indifference curve *IV* is lower than VII, the nation's welfare will decline even more now. The bottom panel shows with offer curves the effect of this type of growth on the volume and the terms of trade when Nation 1 affects its terms of trade and when it does not.

7.5B Immiserizing Growth

Even if the wealth effect, by itself, tends to increase the nation's welfare, the terms of trade may deteriorate so much as to lead to a net decline in the nation's welfare. This case was termed **immiserizing growth** by *Jagdish Bhagwati* and is illustrated in Figure 7.6.

Figure 7.6 reproduces from Figure 7.3 the production frontier of Nation 1 before and after neutral technical progress doubled the productivity of *L* and *K* in the production

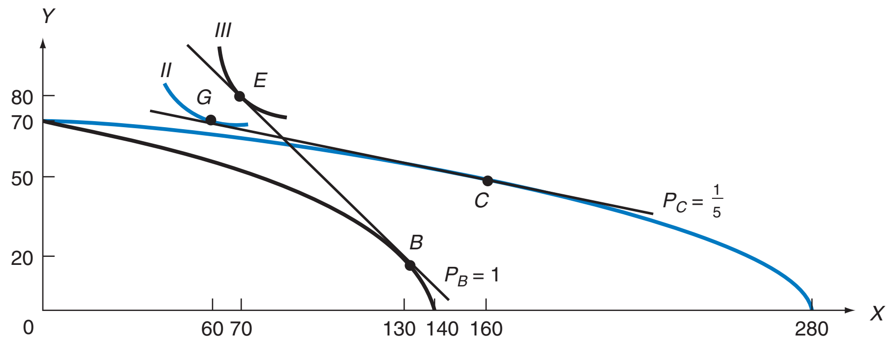

FIGURE 7.6. Immiserizing Growth.
This figure reproduces from Figure 7.3 the production frontier of Nation 1 before and after neutral technical progress increased the productivity of *L* and *K* in the production of commodity X only. With this type of technical progress, the wealth effect, by itself, would increase the welfare of Nation 1. However, Nation 1's terms of trade deteriorate drastically from $P_B = 1$ to $P_C = 1/5$, so that Nation 1 produces at point *C*, exports 100X for only 20Y, and consumes at point *G* on indifference curve *II* (which is lower than indifference curve *III*, which Nation 1 reached with free trade *before* growth).

of commodity X only. The wealth effect, by itself, would increase Nation 1's welfare at constant prices because Nation 1's output increases while its labor force (*L*) and population remain constant. However, since this type of technical progress tends to increase the volume of trade, Nation 1's terms of trade tend to deteriorate. With a drastic deterioration in its terms of trade, for example, from $P_B = 1$ to $P_C = 1/5$, Nation 1 would produce at point *C*, export 100X for only 20Y, and consume at point *G* on indifference curve *II* (which is lower than indifference curve *III*, which Nation 1 reached with free trade *before* growth).

Immiserizing growth is more likely to occur in Nation 1 when (a) growth tends to increase substantially Nation 1's exports at constant terms of trade; (b) Nation 1 is so large that the attempt to expand its exports substantially will cause a deterioration in its terms of trade; (c) the income elasticity of Nation 2's (or the rest of the world's) demand for Nation 1's exports is very low, so that Nation 1's terms of trade will deteriorate substantially; and (d) Nation 1 is so heavily dependent on trade that a substantial deterioration in its terms of trade will lead to a reduction in national welfare.

Immiserizing growth does not seem very prevalent in the real world. When it does take place, it is more likely to occur in developing than in developed nations. Even though the terms of trade of developing nations seem to have deteriorated somewhat over time, increases in production have more than made up for this, and their real per capita incomes and welfare have generally increased. Real per capita incomes would have increased much faster if the population of developing nations had not grown so rapidly in recent decades. These questions and many others will be fully analyzed in Chapter 11, which deals with international trade and economic development.

7.5c Illustration of Beneficial Growth and Trade

We now examine the case where only *K* (Nation 1's scarce factor) doubles in Nation 1, so that the wealth effect, by itself, tends to increase the nation's welfare. The results would be very similar with neutral technical progress in the production of only commodity Y (the K-intensive commodity) in Nation 1. Since this type of growth tends to reduce the volume of trade at constant prices, Nation 1's terms of trade tend to improve. With both the wealth and terms-of-trade effects favorable, Nation 1's welfare definitely improves. This is illustrated in Figure 7.7.

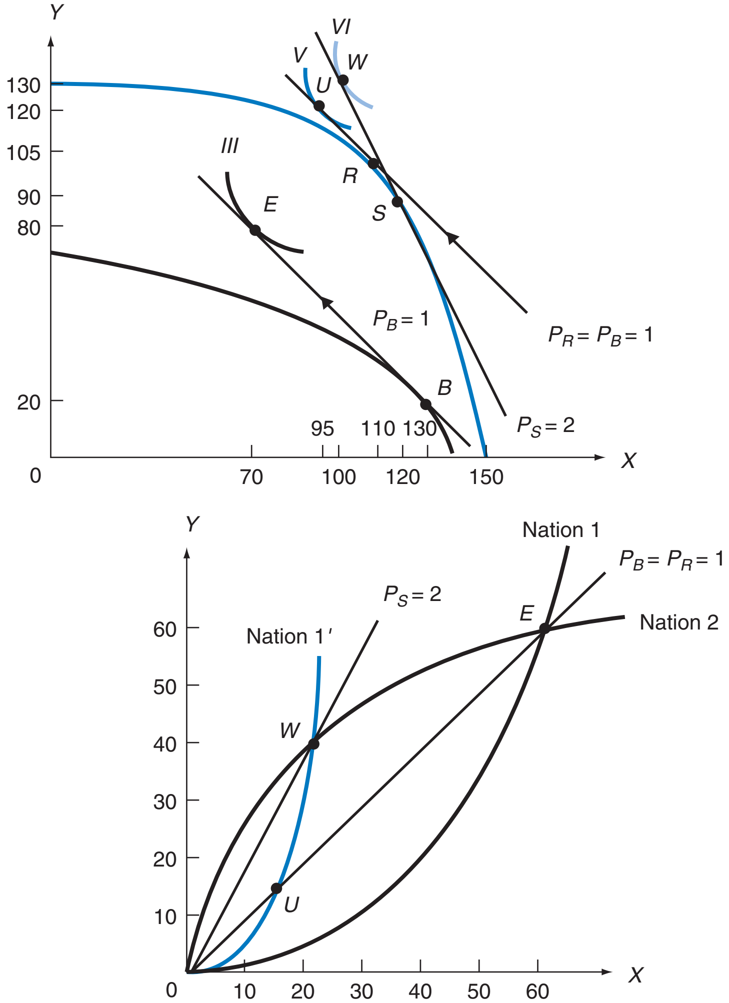

FIGURE 7.7. Growth That Improves Nation 1's Terms of Trade and Welfare.
If K (Nation 1's scarce factor) doubled in Nation 1, production would take place at point R at the unchanged terms of trade of $P_R = P_B = 1$ (see the top panel). Nation 1 would exchange 15X for 15Y with Nation 2 and consume at point U on indifference curve V. However, if Nation 1 is large, its terms of trade will improve because it is willing to export less of X at $P_R = P_B = 1$. At $P_S = 2$, Nation 1 produces at point S, exchanges 20X for 40Y with Nation 2, and consumes at point W on indifference curve VI. Nation 1's welfare increases because of both favorable wealth and terms-of-trade effects. The bottom panel shows with offer curves the effect of this type of growth on the volume and the terms of trade when Nation 1 does not and when it does affect its terms of trade. Compare this to Figure 7.5.

The top panel of the figure shows Nation 1's production frontier before growth and after only K doubles (the dashed production frontier from the right panel of Figure 7.1). At the constant relative commodity price of $P_B = 1$, Nation 1 would produce 110X and 105Y (point R in the top panel), exchange 15X for 15Y with Nation 2, and consume at point U on indifference curve V. With L and population unchanged, this type of growth would increase Nation 1's welfare.

Furthermore, since Nation 1's trade volume declines at constant prices (from the free trade but pregrowth situation at point E), Nation 1's terms of trade also improve, from $P_R = P_B = 1$ to $P_S = 2$. At $P_S = 2$, Nation 1 produces 120X and 90Y at point S, exchanges 20X for 40Y, and consumes at point W on indifference curve VI. Thus, Nation 1's welfare increases because of both wealth and terms-of-trade effects.

The bottom panel of Figure 7.7 shows with offer curves the effect of this type of growth on the volume and the terms of trade when Nation 1 does not and when it does affect its terms of trade. The reader should carefully compare Figure 7.7, where both wealth and terms-of-trade effects are favorable (so that Nation 1's welfare increases for both reasons), with Figure 7.5, where both effects are unfavorable and Nation 1's welfare declines for both reasons. Case Study 7-3 examines growth and the emergence of new economic giants.

CASE STUDY 7-3 Growth and the Emergence of New Economic Giants

New economic giants are emerging among developing countries: Brazil, Russia, India, China, and South Africa (BRICS). China is already an economic giant, India is on the way, and Brazil and Russia are following. South Africa, which was sponsored by China to join in 2011, is much smaller. Table 7.3 provides data on the size and economic importance of the new economic giants in relation to the traditional ones: the United States, the European Union, and Japan.

The most important measure of the economic size of a nation is its gross national income (GNI) at purchasing power parity or PPP. This takes into consideration all the reasons (such undervalued exchange rates and nonmarket production—to be discussed in Section 15.2) which lead to serious underestimation of the true GNI of developing nations with respect to that of developed nations.

Table 7.3 shows that the largest economies in terms of PPP are the 27-member European Union (EU-27, examined in Chapter 10) and the United States, followed by China, Japan, and India. Russia and Brazil are smaller, and South Africa much smaller. In terms of per capita income (per capita GNI at PPP—as a measure of the standard of living), the United States is clearly first, followed by Japan, and EU-27. Russia, Brazil, South Africa, China, and India follow with much lower per capita incomes—especially India. Growth of GNI, however, is much faster in China and India, and faster in Russia, South Africa, and Brazil than in the traditional ones, and the size of their economies (total GNIs at PPP), except South Africa, are expected to surpass those of the United States and the EU-27 in 30–40 years *if current growth differentials persist*. In terms of per capita incomes, it would take much longer.

Even more important than economic size and growth rates, however, is the rising competitive challenge that the new giants are providing to the traditional giants, on both world markets and in their own domestic market, in a widening range of increasingly sophisticated products (especially China) and services (especially India).

(continued)

■ CASE STUDY 7-3 Continued

■ TABLE 7.3. Relative Economic Size of the New and Traditional Economic Giants in 2010

	Population (million)	Land Area (sq. km.)	GNI* (billion $)	Per Capita GNI($)*	Average Growth Rate of GNI (%) (2000–2010)
China	1,338	9,598	10,132	7,570	10.8
India	1,171	3,287	4,171	3,560	8.0
Brazil	195	8,515	2,129	10,920	3.7
Russia	142	17,098	2,721	19,190	5.4
S. Africa	50	1,219	514	10,280	3.9
USA	310	9,632	14,562	47,020	1.9
EU 27	501	4,308	15,870	31,677	2.1
Japan	127	378	4,432	34,790	0.9

*Purchasing Power Parity (PPP).
Source: World Bank, *World Development Report*, 2012.

7.6 Growth, Change in Tastes, and Trade in Both Nations

Until now, we have assumed that growth took place only in Nation 1. As a result, only Nation 1's production frontier and offer curve shifted. We now extend our analysis to incorporate growth in both nations. When this occurs, the production frontiers and offer curves of both nations shift. We will now use offer curves to analyze the effect of growth and change in tastes in both nations.

7.6A Growth and Trade in Both Nations

Figure 7.8 shows the effect on the volume and terms of trade of various types of growth in either or both nations. We assume that both nations are large. The offer curves labeled "1" and "2" are the original (pregrowth) offer curves of Nation 1 and Nation 2, respectively. Offer curves "1^*" and "2^*" and offer curves "$1'$" and "$2'$" are the offer curves of Nation 1 and Nation 2, respectively, with various types of growth. A relative commodity price line is not drawn through each equilibrium point in order not to clutter the figure. However, Nation 1's terms of trade (i.e., P_X/P_Y) at each equilibrium point are obtained by dividing the *quantity of commodity Y by the quantity of commodity X* traded at that point. Nation 2's terms of trade at the same equilibrium point are then simply the inverse, or reciprocal, of Nation 1's terms of trade.

With the original pregrowth offer curves 1 and 2, Nation 1 exchanges 60X for 60Y with Nation 2 at $P_B = 1$ (see equilibrium point E_1). If L doubles in Nation 1 (as in Figure 7.5), its offer curve rotates clockwise from 1 to 1^* and Nation 1 exports 140X for 70Y (point E_2). In this case, Nation 1's terms of trade deteriorate to $P_X/P_Y = 70Y/140X = ½$, and Nation 2's terms of trade improve to $P_Y/P_X = 2$.

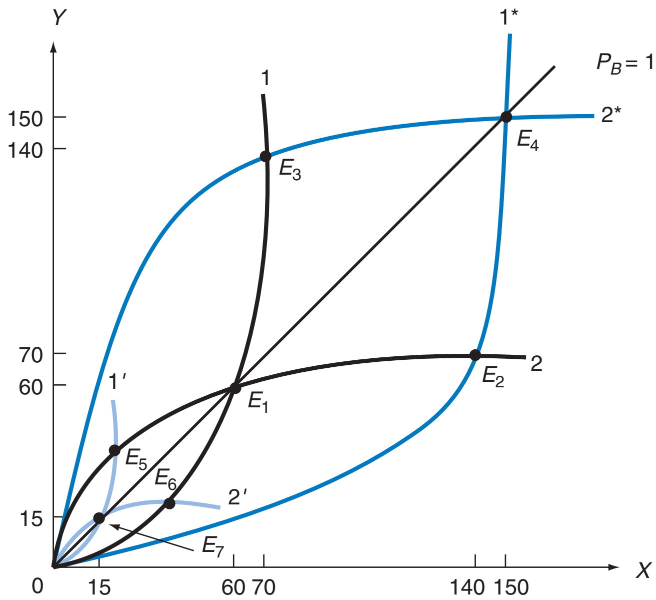

FIGURE 7.8. Growth and Trade in Both Nations.
If *L* (Nation 1's abundant factor) doubles in Nation 1, its offer curve rotates from 1 to 1*, giving equilibrium E_2, with a larger volume but lower terms of trade for Nation 1. If *K* (Nation 2's abundant factor) increases in Nation 2 and its offer curve rotates from 2 to 2*, equilibrium occurs at E_3, with a larger volume but lower terms of trade for Nation 2. If instead *K* doubles in Nation 1, its offer curve rotates to 1′, with a reduction in volume but an increase in Nation 1's terms of trade. If *L* increases in Nation 2 and its offer curve rotates to 2′, equilibrium occurs at E_6, with a reduction in volume but an improvement in Nation 2's terms of trade. If both offer curves shift to 1′ and 2′, the volume of trade declines even more (see E_7), and the terms of trade of both nations remain unchanged.

If growth occurs only in Nation 2 and its offer curve rotates counterclockwise from 2 to 2^*, we get equilibrium point E_3. This might result, for example, from a doubling of *K* (the abundant factor) in Nation 2. At E_3, Nation 2 exchanges 140Y for 70X with Nation 1; thus, Nation 2's terms of trade deteriorate to $P_Y/P_X = ½$, and Nation 1's terms of trade improve to $P_X/P_Y = 2$. With growth in both nations and offer curves 1^* and 2^*, we get equilibrium point E_4. The volume of trade expands to 140X for 140Y, but the terms of trade remain at 1 in both nations.

On the other hand, if *K* doubled in Nation 1 (as in Figure 7.7), its offer curve would rotate counterclockwise from 1 to 1′ and give equilibrium point E_5. Nation 1 would then exchange 20X for 40Y with Nation 2 so that Nation 1's terms of trade would improve to 2 and Nation 2's terms of trade would deteriorate to ½. If instead Nation 2's labor only grows in such a manner that its offer curve rotates clockwise to 2′, we get equilibrium point E_6. This might result, for example, from a doubling of *L* (the scarce factor) in Nation 2. Nation 2 would then exchange 20Y for 40X with Nation 1, and Nation 2's terms of trade would increase to 2 while Nation 1's terms of trade would decline to ½. If growth occurred in both nations in such a way that offer curve 1 rotated to 1′ and offer curve 2 rotated to 2′, then the volume of trade would be only 15X for 15Y, and both nations' terms of trade would remain unchanged at the level of 1 (see equilibrium point E_7).

With balanced growth or neutral technical progress in the production of both commodities in both nations, both nations' offer curves will shift outward and move closer to the axis measuring each nation's exportable commodity. In that case, the volume of trade will expand and the terms of trade can remain unchanged or improve for one nation and deteriorate for the other, depending on the shape (i.e., the curvature) of each nation's offer curve and on the degree by which each offer curve rotates.

7.6B Change in Tastes and Trade in Both Nations

Through time not only do economies grow, but national tastes are also likely to change. As we have seen, growth affects a nation's offer curve through the effect that growth has on the nation's production frontier. Similarly, a change in tastes affects a nation's offer curve through the effect that the change in tastes has on the nation's indifference map.

If Nation 1's desire for commodity Y (Nation 2's exportable commodity) increases, Nation 1 will be willing to offer more of commodity X (its exportable commodity) for each unit of commodity Y imported. Another way of stating this is that Nation 1 will be willing to accept less of commodity Y for a given amount of commodity X that it exports. This will cause Nation 1's offer curve to rotate clockwise, say from 1 to 1^* in Figure 7.8, causing an increase in the volume of trade but a decline in Nation 1's terms of trade.

On the other hand, if Nation 2's tastes for commodity X increase, its offer curve will rotate counterclockwise, say from 2 to 2^*, increasing the volume of trade but reducing Nation 2's terms of trade. If tastes change in the opposite direction, the offer curves will rotate in the opposite direction. If tastes change in both nations, both offer curves will rotate. What happens to the volume of trade and the terms of trade then depends on the type and degree of the change in tastes taking place in each nation, just as in the case of growth.

Summarizing, we can say that with growth and/or a change in tastes in both nations, both nations' offer curves will shift, changing the volume and/or the terms of trade. Regardless of its source, a shift in a nation's offer curve toward the axis measuring its exportable commodity tends to expand trade at constant prices and reduce the nation's terms of trade. Opposite shifts in the nation's offer curve tend to reduce the volume of trade at constant prices and improve the nation's terms of trade. For a given shift in its offer curve, the nation's terms of trade will change more, the greater is the curvature of the trade partner's offer curve.

Case Study 7-4 examines the growth of output, trade, and welfare in the G-7 group of industrial countries. (Growth and trade in developing countries are examined in Chapter 11.)

CASE STUDY 7-4 Growth, Trade, and Welfare in the Leading Industrial Countries

Table 7.4 presents data on the average annual rate of growth of real gross domestic product (GDP), exports, terms of trade, and per capita income for the G-7 (leading industrial) countries from 1990 to 2010. The table shows that the average annual rate of growth of real GDP ranged from 2.8 in the United States to 0.9 percent in Italy, for an unweighted average of 1.8 percent for all G-7 countries. The average rate of growth of the volume of exports ranged from 6.1 percent for Germany to 2.7 for Japan, for an average of 4.5 percent for all 7 countries. Thus, exports grew 2.5 times as rapidly as GDP.

(continued)

CASE STUDY 7-4 Continued

The change in the terms of trade ranged from an average yearly decline of 1.1 percent in Japan to an improvement of 1.1 percent for Canada (due primarily to the sharp increase in the price of its fuels and mineral exports), for a zero unweighted average change for all seven countries. The last column of Table 7.4 shows that the annual growth of real per capita GDP (as a rough measure of the average increase in standards of living) ranged from 1.8 percent in the United States to 0.3 percent for Italy, for an unweighted average increase of 1.6 percent per year for all seven countries. Although many factors contributed to the growth of real per capita GDP, the growth of exports was certainly one of them.

TABLE 7.4. Growth of GDP and Exports, and the Terms of Trade, 1990–2010

	Average Annual Percentage Change			
	Real GDP	Volume of Exports	Terms of Trade	Per Capita GDP
United States	2.8	5.4	−0.2	1.8
Japan	1.0	2.5	−1.1	0.9
Germany	1.4	6.1	−0.3	1.4
United Kingdom	2.2	3.8	0.1	1.7
France	1.6	6.7	0.0	1.0
Italy	0.9	2.7	0.2	0.3
Canada	2.6	4.5	1.1	1.6
Unweighted average	1.8	4.5	0.0	1.2

Source: International Monetary Fund, *International Financial Statistics* (Washington, D.C., various issues); Organization for Economic Cooperation and Development, *Economic Outlook* (Paris, various issues); and World Bank, *World Development Indicators* (Washington, D.C., various issues).

SUMMARY

1. The trade theory discussed in previous chapters was for the most part static in nature. That is, given the nation's factor endowments, technology, and tastes, we proceeded to determine its comparative advantage and the gains from trade. However, factor endowments change through time; technology usually improves; and tastes may also change. In this chapter, we examined the effect of these changes on the equilibrium position. This is known as comparative static analysis.

2. With constant returns to scale and constant prices, if L and K grow at the same rate (balanced growth), the nation's production frontier will shift out evenly in all directions at the rate of factor growth, and output per worker will remain constant. If L grows faster than K, the nation's production frontier will shift proportionately more in the direction of the L-intensive commodity, and output per worker will decline. The opposite is true if K grows faster than L. The Rybczynski theorem postulates that at constant commodity prices, an increase in the endowment of one factor will increase by a greater proportion the output of the commodity intensive in that factor and will reduce the output of the other commodity.

3. All technical progress reduces the amount of L and K required to produce any given output, shifts the production frontier outward, and tends to increase the nation's welfare. Hicksian neutral technical progress increases the productivity of L and K in the same proportion and has the same effect on the nation's production frontier as balanced factor growth. As a result, K/L remains unchanged at constant relative factor prices (w/r). L-saving technical progress increases the productivity of K proportionately more than the productivity of L. As a result, K is substituted for L in production so that K/L rises at unchanged w/r. K-saving technical progress is the opposite of L-saving technical progress.

4. Production and consumption can be protrade (if they lead to a greater-than-proportionate increase in trade at constant prices), antitrade, or neutral. Production is protrade if the output of the nation's exportable commodity increases proportionately more than the output of its importable commodity. Consumption is protrade if the nation's consumption of its importable commodity increases proportionately more than consumption of its exportable commodity. What happens to the volume of trade in the process of growth depends on the net result of the production and consumption effects.

5. If growth, regardless of its source and type, increases the nation's volume of trade at constant prices, the nation's terms of trade tend to deteriorate. Otherwise, the nation's terms of trade tend to remain unchanged or improve. The effect of growth on the nation's welfare also depends on a wealth effect. This refers to the change in output per worker or per person as a result of growth. If both the terms-of-trade and wealth effects of growth are favorable, the nation's welfare will definitely improve. Otherwise, it will remain the same or decline, depending on the net result of these two effects. The case where an unfavorable terms-of-trade effect overwhelms even a favorable wealth effect and leads to a decline in the nation's welfare is known as "immiserizing growth."

6. With growth and/or a change in tastes in both nations, both nations' offer curves will shift, changing the volume and/or the terms of trade. Regardless of its source, a shift in a nation's offer curve toward the axis measuring its exportable commodity tends to expand trade at constant prices and reduce the nation's terms of trade. Opposite shifts in the nation's offer curve tend to reduce the volume of trade at constant prices and improve the nation's terms of trade. For a given shift in its offer curve, the nation's terms of trade will change more the greater the curvature is of its trade partner's offer curve.

A LOOK AHEAD

This chapter concludes our presentation of international trade theory. We now go on to Part Two, which deals with trade policies. We begin with a discussion of tariffs in Chapter 8. We will be primarily concerned with the welfare effects of tariffs on the nation imposing them and on the rest of the world. The welfare effects of tariffs will be analyzed first from a partial equilibrium and then from a general equilibrium point of view, utilizing the tools of analysis and figures developed in Part One.

KEY TERMS

Antitrade production and consumption, p. 196
Balanced growth, p. 190
Capital-saving technical progress, p. 194
Comparative statics, p. 190
Dynamic analysis, p. 190
Immiserizing growth, p. 202
Inferior good, p. 199
Labor-saving technical progress, p. 194
Neutral production and consumption, p. 196
Neutral technical progress, p. 193
Normal goods, p. 199
Protrade production and consumption, p. 196
Rybczynski theorem, p. 192
Terms-of-trade effect, p. 201
Wealth effect, p. 201

QUESTIONS FOR REVIEW

1. What is meant when we say that the trade theory discussed in previous chapters is static in nature? What is meant by comparative statics?

2. How can our trade theory of previous chapters be extended to incorporate changes in the nation's factor endowments, technology, and tastes? Is the resulting trade theory a dynamic theory of international trade? Why?

3. What effect do the various types of factor growth have on the growing nation's production frontier? What is meant by balanced growth?

4. What does the Rybczynski theorem postulate?

5. Explain neutral, labor-saving, and capital-saving technical progress.

6. How does neutral technical progress in the production of either or both commodities affect the nation's production frontier? Which type of technical progress corresponds to balanced factor growth as far as its effect on the growing nation's production frontier is concerned?

7. What is meant by production and/or consumption being protrade, antitrade, or neutral?

8. Which sources of growth are most likely to be protrade? Which sources of growth are most likely to be antitrade? Which types of commodities are most likely to result in protrade consumption? antitrade consumption?

9. What is the terms-of-trade effect of growth? What is the wealth effect of growth? How can we measure the change in the welfare of the nation as a result of growth and trade when the nation is too small to affect relative commodity prices? when the nation is large enough to affect relative commodity prices?

10. Which type of growth will most likely lead to a decline in the nation's welfare? What is meant by immiserizing growth? Which type of growth will most likely lead to an increase in the nation's welfare?

11. What is the effect on the volume and terms of trade if a nation's offer curve shifts or rotates toward the axis measuring its exportable commodity? What type of growth and/or change in tastes in the nation will cause its offer curve to shift or rotate this way?

12. How does the shape of the trade partner's offer curve affect the change in the terms of trade resulting from a given shift in a nation's offer curve?

PROBLEMS

1. Starting with Nation 2's pregrowth production frontier of previous chapters, draw a new production frontier for Nation 2 showing that:

(a) The amount of both capital and labor available to Nation 2 doubled.

(b) Only the amount of capital doubled.

(c) Only the amount of labor doubled.

2. Starting with Nation 2's pregrowth production frontier of previous chapters, draw a new production frontier for Nation 2 showing the Rybczynski theorem for the doubling of the amount of capital only.

3. Starting with Nation 2's pregrowth production frontier, draw a production frontier for Nation 2 showing neutral technical progress that doubles the productivity of labor and capital in the production of:

(a) Both commodity X and commodity Y.

(b) Commodity X only.

(c) Commodity Y only.

4. Compare the graphs in Problem 3 with those in Problems 1 and 2.

***5.** Draw for Nation 2 a figure analogous to the top panel of Figure 7.4 under the following assumptions:

(a) Only the amount of capital doubles in Nation 2.

(b) The free trade equilibrium-relative commodity price is $P_X/P_Y = 1$.

(c) Nation 2 is too small to affect the relative commodity prices at which it trades before and after growth.

(d) Nation 2 exports 150Y after growth.

***6.** Draw for Nation 2 a figure analogous to the bottom panel of Figure 7.4 under the same assumptions as in Problem 5.

7. Draw for Nation 2 a figure analogous to the top panel of Figure 7.5 under the following assumptions:

(a) Nation 2 is now large enough to affect the relative commodity prices at which it trades.

(b) The terms of trade of Nation 2 deteriorate from $P_Y/P_X = 1$ with free trade before growth to $P_Y/P_X = ½$ with growth and free trade.

(c) Nation 2 exports 140Y with growth and free trade.

8. Draw for Nation 2 a figure analogous to the bottom panel of Figure 7.5 under the same assumptions as in Problem 7.

***9.** Draw a figure analogous to Figure 7.6 showing immiserizing growth for Nation 2 when the productivity of capital and labor doubled only in the production of commodity Y in Nation 2.

10. Draw a figure similar to Figure 7.6 but showing immiserizing growth for an increase in the population and labor force of a nation.

11. Draw for Nation 2 a figure analogous to the top panel of Figure 7.7 under the following assumptions:

(a) Only the amount of labor doubles in Nation 2.

(b) The terms of trade of Nation 2 improve from $P_Y/P_X = 1$ with free trade before growth to $P_Y/P_X = 2$ with growth and free trade.

(c) Nation 2 exports 20Y with growth and free trade.

12. Draw for Nation 2 a figure analogous to the bottom panel of Figure 7.7 under the same assumptions as in Problem 11.

13. The data in Table 7.2 indicate that the United States has the smallest increase in output per worker, no improvements in efficiency, and a small improvement in technology in relation to other developed countries in the table. This seems to contradict the information in Table 6.5. How can this seeming contradiction be resolved?

* = Answer provided at www.wiley.com/college/salvatore.

APPENDIX

This appendix presents the formal proof of the Rybczynski theorem in Section A7.1; it examines growth when one factor is not mobile within the nation in Section A7.2; and it gives a graphical interpretation of Hicksian neutral, labor-saving, and capital-saving technical progress in Section A7.3.

A7.1 Formal Proof of the Rybczynski Theorem

As discussed in Section 7.2B, the Rybczynski theorem postulates that at constant commodity prices, an increase in the endowment of one factor will increase by a greater proportion the output of the commodity intensive in that factor and will reduce the output of the other commodity.

The formal proof of the Rybczynski theorem presented here closely follows the analysis for the derivation of a nation's offer curve from its Edgeworth box diagram presented in Section A3.3. Starting from Figure 3.10, we formally prove the Rybczynski theorem for the case where only the amount of labor doubles in Nation 1.

The theorem could be proved either by starting from the free trade production point *B* (as in Figure 7.2) or by starting from the autarky, or no-trade, production and consumption equilibrium point *A* (from previous chapters). The starting point is immaterial as long as the new production point after growth is compared with the particular initial point chosen and commodity prices are kept at the same level as at the initial equilibrium point. We will start from point *A* because that will also allow us to examine the implications of the Rybczynski theorem for relative commodity prices in the absence of trade.

Figure 7.9 shows the proof. Point *A* on Nation 1's production frontier (in the bottom part of Figure 7.9) is derived from point *A* in Nation 1's Edgeworth box diagram (in the top of the figure) before the amount of labor doubles. This is exactly as in Figure 3.9. After the amount of labor doubles, Nation 1's Edgeworth box doubles in length but remains the same height (because the amount of capital is kept constant).

For commodity prices to remain constant, factor prices must remain constant. But relative factor prices can remain constant only if *K/L* and the productivity of *L* and *K* remain constant in the production of both commodities. The only way for *K/L* to remain constant, and for all of *L* and *K* to remain fully employed after *L* doubles, is for production in Nation 1 to move from point *A* to point A^*, in the Edgeworth box in the top part of the figure. At points *A* and A^*, *K/L* in the production of commodity X is the same because point A^* lies on the same ray from origin O_X as point *A*. Similarly, *K/L* in the production of commodity Y at point A^* is the same as at point *A* because the dashed ray from origin O_Y^* to point A^* has the same

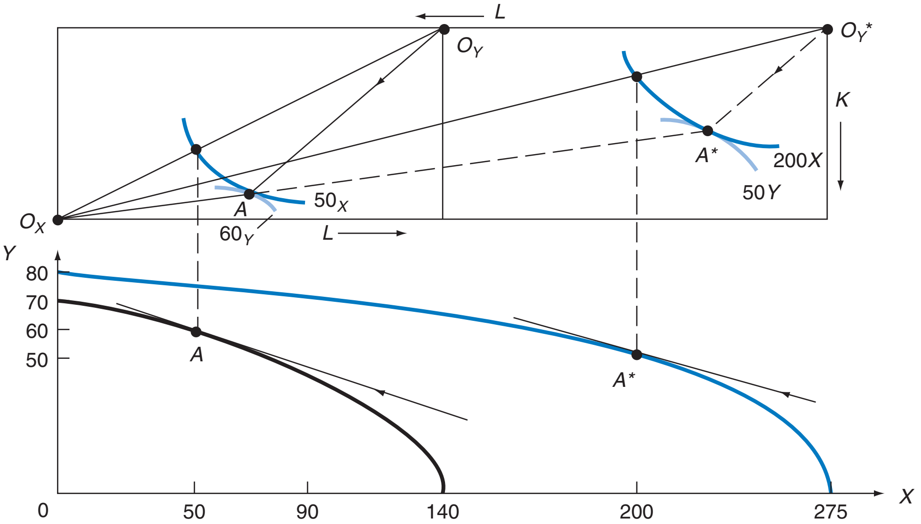

FIGURE 7.9. Graphical Proof of the Rybczynski Theorem.
Point *A* on Nation 1's production frontier (in the bottom part of the figure) is derived from point *A* in Nation 1's Edgeworth box (in the top part of the figure). This is exactly as in Figure 3.9. Doubling *L* doubles the size of the box. For P_X and P_Y to remain the same, *w* and *r* must remain constant. But *w* and *r* can remain constant only if *K/L* remains constant in the production of both commodities. Point A^* in the top and bottom parts of the figure is the only point where this is possible and all of the increase in *L* is fully absorbed. At point A^*, *K/L* in the production of both commodities is the same as at point *A*. At A^*, the output of commodity X (the *L*-intensive commodity) more than doubles, while the output of commodity Y declines, as postulated by the Rybczynski theorem.

slope as the ray from origin O_Y to point A. Point A^* is the only point in the Edgeworth box consistent with full employment of all resources after L has doubled and with K/L constant in the production of both commodities. Note that isoquants have the same slope at points A and A^*, indicating that w/r is the same at both points.

Since point A^* is much farther from origin O_X than point A in the Edgeworth box, Nation 1's output of commodity X has increased. On the other hand, since point A^* is closer to origin O_Y^* than point A is to origin O_Y, Nation 1's output of commodity Y has declined. These events are reflected in the movement from point A on Nation 1's production frontier before L doubled to point A^* on its production frontier after L doubled. That is, at point A on its production frontier before growth, Nation 1 produced 50X and 60Y, whereas at point A^* on its production frontier after growth, Nation 1 produced 200X but only 50Y at $P_A/P_A^* = 1/4$. Doubling L more than doubles (in this case, it quadruples) the output of commodity X. That is, the growth of L has a magnified effect on the growth of the output of commodity X (the L-intensive commodity). This completes our proof of the Rybczynski theorem.

After proving that the output of commodity Y falls at constant P_X/P_Y, we must immediately add that P_X/P_Y cannot remain constant unless commodity Y is an inferior good. Only then would the consumption of commodity Y decline absolutely in Nation 1 with the growth of its real *national* income and no trade. Barring inferior goods, P_X/P_Y must fall (P_Y/P_X rises) so that absolutely more of commodity Y is also produced and consumed after growth and with no trade. Thus, keeping relative commodity prices constant is only a way of analyzing what would happen to the output of each commodity *if relative commodity prices remained constant*. However, relative commodity prices cannot remain constant unless commodity Y is inferior or there is free trade and Nation 1 is assumed to be too small to affect the relative commodity prices at which it trades. In that case, Nation 1 can consume more of both commodities after growth even with constant relative commodity prices and without commodity Y having to be an inferior good. This is exactly what Figure 7.4 shows.

Problem (a) Starting from pretrade, or autarky, equilibrium point A^* in Nation 2, prove graphically the Rybczynski theorem for a doubling in the amount of K in Nation 2. (b) What restrictive assumption is required for production and consumption actually to occur at the new equilibrium point after the doubling of K in Nation 2? (c) How are relative commodity prices likely to change as a result of growth only? as a result of both growth and free trade?

A7.2 Growth with Factor Immobility

We know from the Rybczynski theorem that at constant commodity prices, an increase in the endowment of one factor will increase by a greater proportion the output of the commodity intensive in that factor and will reduce the output of the other commodity. We also know that factor prices are constant at constant commodity prices.

We now want to analyze the effect of factor growth when one of the factors is not mobile between the nation's industries and commodity prices are constant. We can analyze this case by using the specific-factors model developed in Section A5.4 of the appendix to Chapter 5. We will see that the results differ from those predicted by the Rybczynski theorem and depend on whether it is the growing or the nongrowing factor that is immobile within the nation.

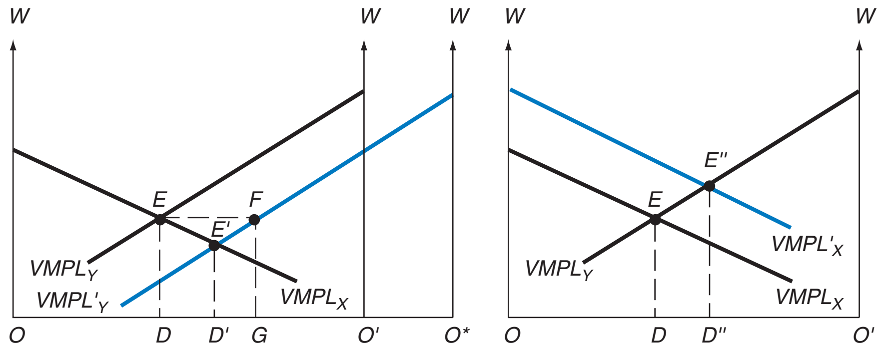

FIGURE 7.10. Growth with the Specific-Factors Model.
Before growth and with L mobile and K immobile in the nation, $w = ED$, and OD of L is used to produce X and DO' to produce Y in both panels. In the left panel, an increase in L of $O'O^* = EF = DG$ results in a fall in wages to $E'D'$, and DD' more L used in the production of X and $D'G$ in Y. The output of X and Y increases, and r rises in both industries. In the right panel, K increases in the production of X only. This causes the $VMPL_X$ curve to shift up to $VMPL'_X$. The wage rate rises to $w = E''D''$, and DD'' of L is transferred from Y to X. The output of X rises and that of Y falls, and r falls in both industries with unchanged commodity prices.

The left panel of Figure 7.10 refers to an increase in the supply of labor (the relatively abundant and mobile factor in Nation 1), and the right panel refers to an increase in the supply of capital (the scarce and immobile factor in Nation 1). In both panels, we begin (as in Figure 5.8) with a total supply of labor in the nation equal to OO'. The equilibrium wage in both industries is ED and is determined by the intersection of the $VMPL_X$ and $VMPL_Y$ curve. OD of labor is used in the production of commodity X and DO' in the production of commodity Y.

Let us now concentrate on the left panel of Figure 7.10, where the supply of labor increases and labor is mobile, while capital is not. If the supply of labor increases by $O'O^* = EF = DG$ from OO' to OO^*, the new equilibrium wage in both industries is $E'D'$ and is determined at the intersection of the $VMPL_X$ and $VMPL'_Y$ curves. Of the DG increase in the supply of labor, DD' is employed in the production of commodity X and $D'G$ in the production of commodity Y. Since the amount of capital used in each industry does not change but the amount of labor increases, the output of both commodities increases. However, the output of commodity X increases by more than the output of commodity Y because commodity X is L intensive and more of the increase in labor is employed in the production of commodity X. Furthermore, since more labor is used in each industry with unchanged amounts of capital, the $VMPK$ and the return on capital (r) rise in both industries.

Thus, when the supply of labor increases and labor is mobile but capital is not, the output of both commodities increases, and w falls and r rises in both industries, at constant commodity prices. In the long run (when both labor and capital are mobile within the nation), an increase in the supply of labor increases the output of commodity X by a greater proportion, reduces the output of commodity Y, and leaves w and r unchanged at constant commodity prices (the Rybczynski theorem).

Let us turn to the right panel of Figure 7.10, where the supply of capital (Nation 1's scarce and immobile factor) increases in the production of commodity X only. Since each unit of labor in the production of commodity X will have more capital to work with, the $VMPL_X$ curve shifts up to $VMPL'_X$. The intersection of the $VMPL'_X$ and $VMPL_Y$ curves now determines the new and higher equilibrium wage of $E''D''$ in both industries, and DD'' of labor is transferred from the production of commodity Y to the production of commodity X. Since w rises in both industries, r must fall in both in order for commodity prices to remain constant (as assumed). Furthermore, since both more capital and more labor are used in the production of commodity X, the output of commodity X rises. On the other hand, since the same amount of capital but less labor is used in the production of commodity Y, the output of commodity Y declines. Thus, in this case, the changes in outputs are similar to those postulated by the Rybczynski theorem.

All of the above results, however, are based on the assumption that commodity prices do not change. Since the output of commodity X increases while that of Y falls (or increases by less than the increase in the output of X), P_X/P_Y is likely to fall, and this lowers the terms of trade of the nation (unless Nation 1 is small) and modifies the effects of growth on factor prices derived above (on the basis of unchanged commodity prices).

Problem What happens if the supply of capital increases in Nation 1 in the production of commodity Y only?

A7.3 Graphical Analysis of Hicksian Technical Progress

In this section we give a graphical interpretation of the Hicksian classification of neutral, L-saving, and K-saving technical progress using isoquants (reviewed in Sections A3.1 and A3.2). We also examine the effect of the various types of technical progress on relative factor prices.

All innovations, regardless of their type, can be represented by a shift toward the origin of the isoquant referring to any given level of output. This indicates that fewer inputs or factors are required to produce any level of output after technical progress has occurred. The distinction between various types of technical progress is based on the effect that each has on K/L at constant relative factor prices (w/r).

Hicksian technical progress is *neutral* if it leaves K/L unchanged. Technical progress is *labor saving* if it tends to increase K/L and *capital saving* if it tends to reduce K/L. These are shown in Figure 7.11.

In all three panels of the figure, we begin at point A_1, where 100X is produced with $4L$ and $4K$ before technical progress occurs. After neutral technical progress, the same 100X can be produced with $2L$ and $2K$ (point A_2 in the left panel), leaving $K/L = 1$ at unchanged $w/r = 1$ (the absolute slope of the isocosts). With L-saving technical progress, the same 100X can be produced with $3K$ and $1L$ (point A_3 in the middle panel) and $K/L = 3$ at unchanged $w/r = 1$. Finally, with K-saving technical progress, the same 100X can be produced with $1K$ and $3L$ (point A_3 in the right panel) and $K/L = 1/3$ at unchanged $w/r = 1$.

At point A_2 in the middle panel, the ratio of the marginal productivity of K to the interest rate (i.e., MPK/r) exceeds MPL/w, and so K is substituted for L in the production of commodity X. As K is substituted for L, r/w will tend to rise, thus moderating the tendency of K/L to rise. In any event, r is likely to rise in relation to w as a result of the L-saving innovation.

On the other hand, at point A_2 in the right panel, MPL/w exceeds MPK/r, and so L is substituted for K in the production of commodity X. As L is substituted for K, w/r will

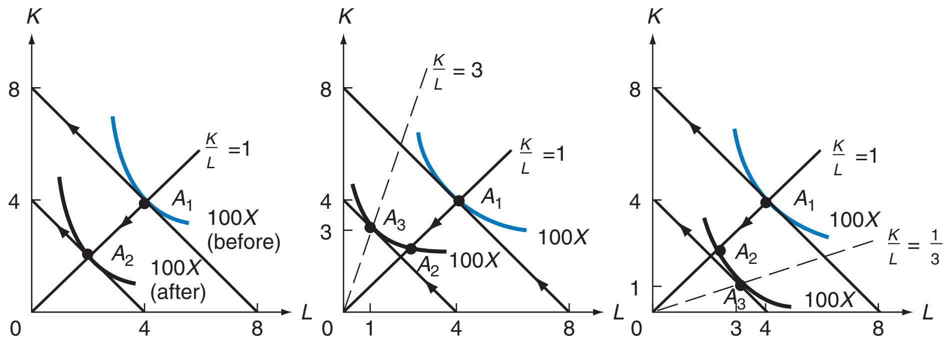

FIGURE 7.11. Hicksian Neutral, L-Saving, and K-Saving Technical Progress.
In all three panels of the figure, we begin at point A_1, where 100X is produced with 4L and 4K before technical progress occurs. After neutral technical progress, the same 100X can be produced with 2L and 2K (point A_2 in the left panel), leaving $K/L = 1$ at unchanged $w/r = 1$ (the absolute slope of the isocosts). With L-saving technical progress, the same 100X can be produced with 3K and 1L (point A_3 in the middle panel) and $K/L = 3$ at unchanged $w/r = 1$. Finally, with K-saving technical progress, the same 100X can be produced with 1K and 3L (point A_3 in the right panel) and $K/L = ^1\!/_3$ at unchanged $w/r = 1$.

tend to rise, thus moderating the tendency of K/L to fall (i.e., L/K to rise). In any event, w is likely to rise in relation to r as a result of the K-saving innovation.

Thus, a greater proportionate increase in the amount of L- and/or a K-saving innovation tends to reduce K/L and w/r. This tendency will be greater if the K-saving innovation takes place in the production of the L-intensive commodity. This is the case because then the demand for labor grows the most. To these effects on w/r resulting purely from internal growth would have to be added the effects resulting from international trade in order to determine the net effect on w/r resulting from both growth and trade. These were discussed in the chapter itself.

Problem Using the tools of analysis developed in this chapter, comment in detail on the following statement: Capital investments tend to increase real wages while technical progress, depending on its type, may increase or reduce real wages.

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INTERNet

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For information and data on growth of output and international trade and their effect on the terms of trade, see the Internet site addresses for the International Monetary Fund (IMF), World Trade Organization (WTO), Organization for Economic Cooperation and Development (OECD), World Bank, and United Nations, respectively, at:

http://www.imf.org

http://www.wto.org

http://www.oecd.org

http://worldbank.org

http://www.un.org/depts/unsd/sd

part 2

International Trade Policy

Part Two (Chapters 8–12) deals with international trade or commercial policies. Chapter 8 examines tariffs, the most important of the trade restrictions historically. Chapter 9 extends the discussion to other trade restrictions, evaluates the justification usually given for trade restrictions, and summarizes their history. Chapter 10 deals with economic integration, Chapter 11 focuses on the effect of international trade on economic development, and Chapter 12 looks at international resource movements and multinational corporations.

Trade Restrictions: Tariffs

chapter

8

LEARNING GOALS:

After reading this chapter, you should be able to:

- Describe the effect of a tariff on consumers and producers
- Identify the costs and benefits of a tariff on a small and a large nation
- Describe an optimum tariff and retaliation
- Understand the meaning and importance of tariff structure

8.1 Introduction

We have seen in Part One that free trade maximizes world output and benefits all nations. However, practically all nations impose some restrictions on the free flow of international trade. Since these restrictions and regulations deal with the nation's trade or commerce, they are generally known as trade or commercial policies. While trade restrictions are invariably rationalized in terms of national welfare, in reality they are usually advocated by those special groups in the nation that stand to benefit from such restrictions.

The most important type of trade restriction has historically been the tariff. A tariff is a tax or duty levied on the traded commodity as it crosses a national boundary. In this chapter we deal with tariffs, and in the next chapter we discuss other trade restrictions. An import tariff is a duty on the imported commodity, while an export tariff is a duty on the exported commodity. Import tariffs are more important than export tariffs, and most of our discussion will deal with import tariffs. Export tariffs are prohibited by the U.S. Constitution but are often applied by developing countries on their traditional exports (such as Ghana on its cocoa and Brazil on its coffee) to get better prices and raise revenues. Developing nations rely heavily on export tariffs to raise revenues because of their ease of collection. Conversely, industrial countries invariably impose tariffs or other trade restrictions to protect some (usually labor-intensive) industry, while using mostly income taxes to raise revenues.

Tariffs can be ad valorem, specific, or compound. The ad valorem tariff is expressed as a fixed *percentage* of the value of the traded commodity. The specific tariff is expressed as a fixed *sum* per physical unit of the traded commodity. Finally, a compound tariff is a combination of an ad valorem and a specific tariff. For example, a 10 percent ad valorem tariff on bicycles would result in the payment to customs officials of the sum of $10 on each $100 imported bicycle and the sum of $20 on each $200 imported bicycle. On the other hand, a specific tariff of $10 on imported bicycles means that customs officials collect the fixed sum of $10 on each imported bicycle regardless of its price. Finally, a compound duty of 5 percent ad valorem and a specific duty of $10 on imported bicycles would result in the collection by customs officials of the sum of $15 on each $100 bicycle and $20 on each $200 imported bicycle. The United States uses the ad valorem and the specific tariff with about equal frequency, whereas European countries rely mainly on the ad valorem tariff. Most of our presentation in this chapter will be in terms of ad valorem import tariffs.

Tariffs have been sharply reduced since the end of World War II and now average 3 percent on industrial products in developed nations (see Case Study 8-1), but they are much higher in developing nations (see Case Study 8-2). Trade in agricultural commodities is still subject to relatively high trade barriers. These are discussed in the next chapter.

CASE STUDY 8-1 Average Tariff on Nonagricultural Products in Major Developed Countries

Table 8.1 gives the average tariff imposed by the United States, the European Union, Japan, and Canada (i.e., by the leading developed countries and the European Union) on various nonagricultural products in 2010. The table shows that the highest tariff is invariably imposed on imports of clothing, textiles, and leather products (also on fish and fish products in the European Union and Japan, and on transport equipment in the European Union and Canada). But the average tariff level on all non-agricultural products is less than 4 percent. It is even less in some of the smaller developed countries.

TABLE 8.1. Tariffs on Nonagricultural Products in the United States, the European Union, Japan, and Canada in 2010 (Percentages)

	United States	European Union	Japan	Canada
Fish and fish products	1.0	10.5	5.5	0.9
Minerals and metals	1.7	2.0	1.0	1.0
Petroleum	1.4	2.0	0.6	0.5
Chemicals	2.8	4.6	2.2	1.0
Wood, paper, etc.	0.5	0.9	0.8	1.1
Textiles	7.9	6.6	5.5	4.3
Clothing	11.7	11.5	9.2	16.9
Leather, footwear, etc.	3.9	4.2	9.0	4.3
Nonelectric machinery	1.2	1.9	0.0	0.5
Electric machinery	1.7	2.8	0.2	1.1
Transport equipment	3.0	4.3	0.0	5.8
Other manufactures	2.4	2.7	1.2	2.9
Average	3.3	4.0	2.5	2.6

Source: World Trade Organization, *World Trade Report 2011, Part 2* (Geneva: WTO, 2011).

CASE STUDY 8-2 Average Tariffs on Nonagricultural Products in Some Major Developing Countries

Table 8.2 gives the tariff imposed by China, India, Russia, Brazil, Korea, and Mexico on various nonagricultural products in 2010. The table shows that the lowest average tariff (6.6 percent) is imposed by Korea, with the others having average tariffs between 7.7 (Mexico) and 14.2 (Brazil). All six countries, however, have much higher tariffs than developed countries.

TABLE 8.2. Tariffs on Nonagricultural Products in China, India, Russia, Brazil, Korea, and Mexico in 2010 (Percentages)

	China	India	Brazil	Russia	Korea	Mexico
Fish and fish products	10.9	29.8	10.0	12.2	16.1	16.6
Minerals and metals	7.4	7.5	10.1	10.0	4.6	3.8
Petroleum	4.8	3.8	0.2	5.0	4.1	0.1
Chemicals	6.6	7.9	8.3	6.4	5.7	2.6
Wood, paper, etc.	4.4	9.1	10.7	13.2	2.2	5.5
Textiles	9.6	14.7	23.2	11.0	9.1	13.9
Clothing	16.0	13.4	35.0	11.8	12.6	30.0
Leather, footwear, etc.	13.2	10.2	15.7	8.6	7.9	8.8
Nonelectric machinery	8.0	7.3	12.7	3.4	6.0	3.1
Electric machinery	8.3	7.2	14.1	7.4	6.2	4.0
Transport equipment	11.5	20.7	18.1	11.1	5.5	9.6
Other manufactures	11.9	8.9	15.3	11.3	6.7	5.7
Average	8.7	10.1	14.2	8.9	6.6	7.1

Source: World Trade Organization, *World Trade Report 2011*, Part 2 (Geneva: WTO, 2011).

In this chapter, we analyze the effects of a tariff on production, consumption, trade, and welfare in the nation imposing the tariff and on its trade partner(s). We will first do this with partial equilibrium analysis (i.e., by utilizing demand and supply curves) and then by the more complex general equilibrium analysis, which makes use of production possibility frontiers and community indifference curves, or offer curves.

In Section 8.2, we analyze the partial equilibrium effects of a tariff in a country that is too small to affect world prices by its trading. In Section 8.3, we examine the theory of tariff structure. We then shift to the more complex general equilibrium analysis and examine the effects of a tariff in a small nation in Section 8.4 and in a large nation in Section 8.5. Finally, in Section 8.6 we examine the concept of the optimum tariff. The appendix examines the partial equilibrium effects of a tariff in a large nation and derives the formula for the rate of effective protection. It then analyzes graphically the Stolper–Samuelson theorem and its exception, examines the short-run effect of a tariff on factors' income, and shows the measurement of the optimum tariff.

8.2 Partial Equilibrium Analysis of a Tariff

The partial equilibrium analysis of a tariff is most appropriate when a small nation imposes a tariff on imports competing with the output of a small domestic industry. Then the tariff will affect neither world prices (because the nation is small) nor the rest of the economy (because the industry is small).

8.2A Partial Equilibrium Effects of a Tariff

The partial equilibrium effects of a tariff can be analyzed with Figure 8.1, in which D_X is the demand curve and S_X is the supply curve of commodity X in Nation 2. The same type of analysis for Nation 1 is left as an end-of-chapter problem. Nation 2 is now assumed to be small and so is industry X. In the absence of trade, the intersection of D_X and S_X defines equilibrium point E, at which 30X is demanded and supplied at $P_X = \$3$ in Nation 2. With free trade at the world price of $P_X = \$1$, Nation 2 will consume 70X (AB), of which 10X (AC) is produced domestically and the remainder of 60X (CB) is imported (as in the right panel of Figure 3.4). The horizontal dashed line S_F represents the infinitely elastic free trade foreign supply curve of commodity X to Nation 2.

If Nation 2 now imposes a 100 percent ad valorem tariff on the imports of commodity X, P_X in Nation 2 will rise to \$2. At $P_X = \$2$, Nation 2 will consume 50X (GH), of which 20X (GJ) is produced domestically and the remainder of 30X (JH) is imported. The horizontal dashed line $S_F + T$ represents the new tariff-inclusive foreign supply curve of commodity X to Nation 2. Thus, the consumption effect of a tariff (i.e., the reduction in domestic consumption) equals 20X (BN); the production effect (i.e., the expansion of domestic production resulting from the tariff) equals 10X (CM); the trade effect (i.e., the decline in imports) equals 30X ($BN + CM$); and the revenue effect (i.e., the revenue collected by the government) equals \$30 (\$1 on each of the 30X imported, or $MJHN$).

Note that for the same \$1 increase in P_X in Nation 2 as a result of the tariff, the more elastic and flatter D_X is, the greater is the consumption effect (see the figure). Similarly, the more elastic S_X is, the greater is the production effect. Thus, the more elastic D_X and S_X are in Nation 2, the greater is the trade effect of the tariff (i.e., the greater is the reduction in Nation 2's imports of commodity X) and the smaller is the revenue effect of the tariff.

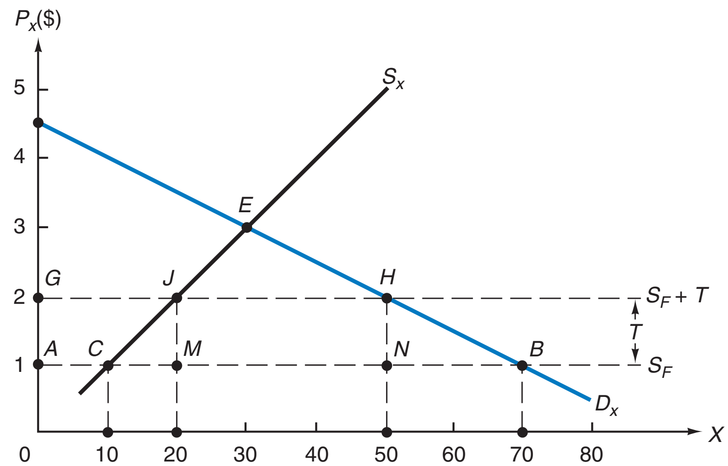

FIGURE 8.1. Partial Equilibrium Effects of a Tariff.
D_X and S_X represent Nation 2's demand and supply curves of commodity X. At the free trade price of $P_X = \$1$, Nation 2 consumes 70X (AB), of which 10X (AC) is produced domestically and 60X (CB) is imported. With a 100 percent import tariff on commodity X, P_X rises to \$2 for individuals in Nation 2. At $P_X = \$2$, Nation 2 consumes 50X (GH), of which 20X (GJ) is produced domestically and 30X (JH) is imported. Thus, the consumption effect of the tariff is (–) 20X (BN); the production effect is 10X (CM); the trade effect equals (–) 30X ($BN + CM$); and the revenue effect is \$30 ($MJHN$).

8.2B Effect of a Tariff on Consumer and Producer Surplus

The increase in the price of commodity X from $P_X = \$1$ to $P_X = \$2$ as a result of the 100 percent tariff that Nation 2 imposes on the importation of commodity X leads to a *reduction in consumer surplus and an increase in producer surplus*. These are examined in Figure 8.2 and used in Section 8.2C to measure the costs and benefits of the tariff.

The left panel of Figure 8.2 shows that the loss of consumer surplus that results from the tariff is equal to shaded area $AGHB$ = \$60. The reason for this is as follows. Before the imposition of the tariff, consumers in Nation 2 consume 70X at $P_X = \$1$. Consumers pay for each unit as much as they are willing to pay for the last, or 70th, unit of commodity X (given by point B on D_X). Consumers, however, receive more satisfaction and would therefore be willing to pay higher prices for earlier units of commodity X that they purchase. In fact, the height of the demand curve shows the maximum price that consumers would be *willing* to pay for each unit of the commodity rather than go without it. The difference between what consumers would be willing to pay for each unit of the commodity (indicated by the height of D_X at that point) and what they actually pay for that unit (the same as for the last unit that they purchase) is called consumer surplus. Thus, consumer surplus is the difference between what consumers would be willing to pay for each unit of the commodity and what they actually pay. Graphically, consumer surplus is measured by the area under the demand curve above the going price.

For example, the left panel of Figure 8.2 shows that consumers in Nation 2 would be willing to pay LE = \$3 for the 30th unit of commodity X. Since they only pay \$1, they receive a consumer surplus of KE = \$2 on the 30th unit of commodity X that they purchase. Similarly, for the 50th unit of commodity X, consumers would be willing to pay ZH = \$2. Since they only pay ZN = \$1, they receive a consumer surplus of NH = \$1 on the 50th unit of X. For the 70th unit of commodity X, consumers would be willing to pay WB = \$1. Since this is equal to the price that they actually pay, the consumer surplus for the 70th unit of X is zero. With the total of 70X being purchased at $P_X = \$1$ in the absence of the import tariff, the total consumer surplus in Nation 2 is equal to ARB = \$122.50 (\$3.50 times 70 divided by 2). This is the difference between what consumers would have been willing to pay ($ORBW$ = \$192.50) and what they actually pay for 70X ($OABW$ = \$70).

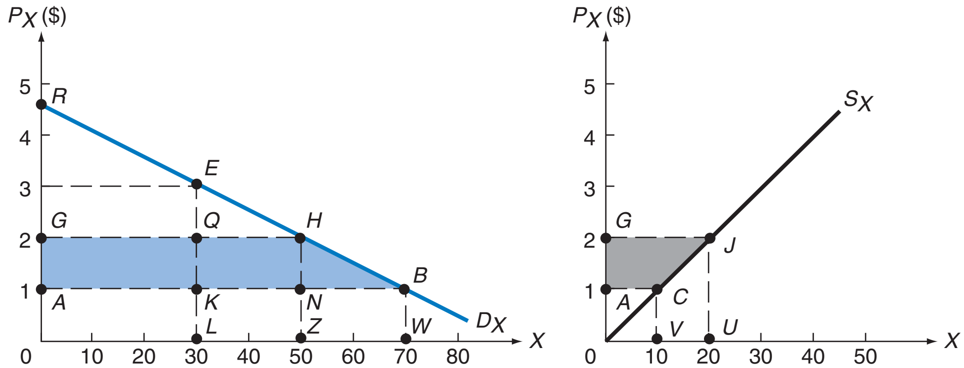

FIGURE 8.2. Effect of Tariff on Consumer and Producer Surplus.
The left panel shows that a tariff that increases the price of commodity X from $P_X = \$1$ to $P_X = \$2$ results in a reduction in consumer surplus from ARB = \$122.50 to GRH = \$62.50, or by shaded area $AGHB$ = \$60. The right panel shows that the tariff increases producer surplus by shaded area $AGJC$ = \$15.

When Nation 2 imposes a 100 percent import tariff, the price of commodity X rises from $P_X = \$1$ to $P_X = \$2$ and purchases of commodity X fall from 70X to 50X. With the tariff, consumers pay $OGHZ = \$100$ for 50X. The consumer surplus thus shrinks from $ARB = \$122.50$ (with $P_X = \$1$ before the tariff) to $GRH = \$62.50$ (when $P_X = \$2$ with the tariff), or by $AGHB = \$60$ (the shaded area in the left panel of Figure 8.2). The imposition of the 100 percent import tariff by Nation 2 thus leads to a reduction in consumer surplus.

In the right panel of Figure 8.2, the increase in rent or producer surplus that results from the tariff is given by shaded area $AGJC = \$15$. The reason for this is as follows. At free trade $P_X = \$1$, domestic producers produce 10X and receive $OACV = \$10$ in revenues. With the tariff and $P_X = \$2$, they produce 20X and receive $OGJU = \$40$. Of the \$30 increase $(AGJC + VCJU)$ in the revenue of producers, $VCJU = \$15$ (the unshaded area under the S_X curve between 10X and 20X) represents the increase in their costs of production, while the remainder (shaded area $AGJC = \$15$) represents the increase in rent or producer surplus. This is defined as a payment that need not be made in the long run in order to induce domestic producers to supply the additional 10X with the tariff. The increase in rent or producer surplus resulting from the tariff is sometimes referred to as the subsidy effect of the tariff.

8.2c Costs and Benefits of a Tariff

The concept and measure of consumer and producer surplus can now be used to measure the costs and benefits of the tariff. These are shown in Figure 8.3, which summarizes and extends the information provided by Figures 8.1 and 8.2.

Figure 8.3 shows that when Nation 2 imposes a 100 percent import tariff, the price of commodity X increases from $P_X = \$1$ to $P_X = \$2$, consumption falls from $AB = 70X$ to

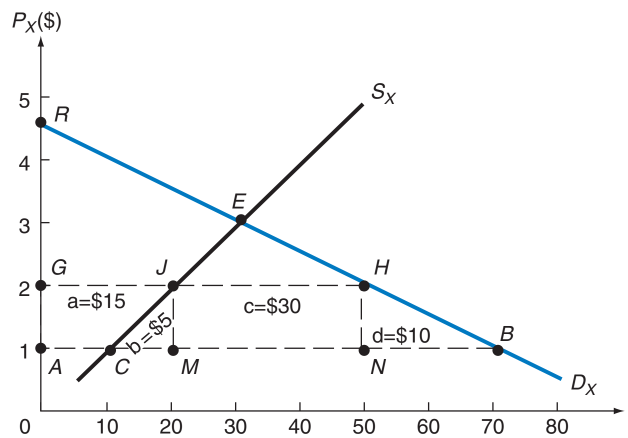

FIGURE 8.3. Partial Equilibrium Costs and Benefits of a Tariff.
The figure shows that with a 100 percent import tariff on commodity X, P_X rises from \$1 to \$2 in Nation 2. This reduces the consumer surplus by $AGHB = a + b + c + d = \$15 + \$5 + \$30 + \$10 = \$60$. Of this, $MJHN = c = \$30$ is collected by the government as tariff revenue, $AGJC = a = \$15$ is redistributed to domestic producers of commodity X in the form of increased rent or producer surplus, while the remaining \$15 (the sum of the areas of triangles $CJM = b = \$5$ and $BHN = d = \$10$) represents the protection cost, or deadweight loss, to the economy.

$GH = 50X$, production increases from $AC = 10X$ to $GJ = 20X$, imports decline from $CB = 60X$ to $JH = 30X$, and the government of Nation 2 collects $MJHN = \$30$ in import duties (as in Figure 8.1). Furthermore, consumer surplus declines by $AGHB = \$60$ (as in the left panel of Figure 8.2), and producer surplus increases by $AGJC = \$15$ (as in the right panel of Figure 8.2).

Figure 8.3 shows that of the reduction of the consumer surplus of $AGHB = a + b + c + d = \$60$, $MJHN = c = \$30$ is collected by the government as tariff revenue, $AGJC = a = \$15$ is redistributed to domestic producers of commodity X in the form of increased producer surplus or rent, while the remaining \$15 (the sum of the areas of triangles $CJM = b = \$5$ and $BHN = d = \$10$) represents the protection cost, or deadweight loss, to the economy.

The production component ($CJM = b = \$5$) of the protection cost, or deadweight loss, arises because, with the tariff, some domestic resources are transferred from the more efficient production of exportable commodity Y to the less efficient production of importable commodity X in Nation 2. The consumption component ($BHN = d = \$10$) of the protection cost, or deadweight loss, arises because the tariff artificially increases P_X in relation to P_Y and distorts the pattern of consumption in Nation 2.

Thus, the tariff redistributes income from domestic consumers (who pay a higher price for the commodity) to domestic producers of the commodity (who receive the higher price) and from the nation's abundant factor (producing exportables) to the nation's scarce factor (producing importables). This leads to inefficiencies, referred to as the protection cost, or deadweight loss, of the tariff. By dividing the loss of consumer surplus by the number of jobs "saved" in the industry because of the tariff (or equivalent rate of protection), we can calculate the cost per domestic job saved (see Case Studies 8-3 and 8-4). (A tariff also has

CASE STUDY 8-3 The Welfare Effect of Liberalizing Trade on Some U.S. Products

Table 8.3 shows the welfare effect of removing trade protection (the tariff or its equivalent, as a percentage of the world price of the product) in 1990 on some specific products on which U.S. protection remained high (despite very low overall average tariff rates). The consumer cost refers to the reduction in consumer surplus resulting from the tariff ($AGHB = a + b + c + d$ in Figure 8.3). The tariff revenue is the revenue collected from the tariff by the U.S. government ($MJHN = c$ in Figure 8.3). Producer gain refers to the increase in the producer surplus resulting from the tariff ($AGJC = a$ in Figure 8.3). The deadweight loss is the protection cost of the tariff ($CJM + BHN$ in Figure 8.3). The table also shows the cost per domestic job "saved" by the tariff. This is obtained by dividing the consumer cost (i.e., reduction in consumer surplus) of the tariff by the number of domestic jobs saved as a result of the tariff.

For example, Table 8.3 shows that the tariff of 20 percent that the United States imposed on imports of rubber footwear (the third line from the bottom in Table 8.3) resulted in a \$208 million cost to U.S. consumers, \$141 million in tariff revenues collected by the U.S. government, \$55 million in producer gain, and \$12 million of deadweight loss. The table also shows that the cost of each job saved in the production of rubber footwear in the United States (as compared with the free trade situation) was about \$122,000 (\$208 million divided by the 1,705 jobs saved). Note the high cost of tariff protection to U.S. consumers even for relatively unimportant products and the very high cost of preserving each job in U.S. import-competing industries.

(continued)

CASE STUDY 8-3 Continued

TABLE 8.3. Economic Effect of U.S. Import Tariffs on Selected Products

Product	Tariff (%)	Consumer Cost (million $)	Tariff Revenue (million $)	Producer Gain (million $)	Dead-weight Cost (million $)	Consumer Costs per Job (thousand $)
Ceramic tiles	19.0	139	92	45	2	401
Costume jewelry	9.0	103	51	46	5	97
Frozen concentrated orange juice	30.0	281	145	101	35	57
Glassware	11.0	266	95	162	9	180
Luggage	16.5	211	169	16	26	934
Rubber footwear	20.0	208	141	55	12	122
Women's footwear	10.0	376	295	70	11	102
Women's handbags	13.5	148	119	16	13	191

Source: G. C. Hufbauer and K. A. Elliott, *Measuring the Cost of Protection in the United States* (Washington, D.C.: Institute for International Economics, 1994), pp. 8–13.

CASE STUDY 8-4 The Welfare Effect of Liberalizing Trade on Some EU Products

Table 8.4 shows the welfare effect of removing trade protection (the tariff or its equivalent, as a percentage of the world price of the product) in 1990 on some specific products on which EU protection remained high (despite very low overall average tariff rates). The interpretation of the table is identical to the U.S. case. The only difference is that benefits and costs are here measured in euros (€), the new currency of 12 of the 15 members of the European Union in 1990 (this is discussed in the finance part of the text). Since at the time of this writing, the value of €1 was approximately $1.30, the equivalent dollar values would be about 30 percent higher than the euro values shown in Table 8.4.

For example, Table 8.4 shows that the tariff (or its equivalent) of 22.9 percent that the European Union imposed on imports of chemical fibers (the first line in Table 8.4) resulted in a €580 (about $754) million cost to EU consumers, €362 ($471) million in tariff revenues collected by the EU governments, €139 ($181) million in producer gain, and €79 ($103) million of deadweight loss. The table also shows that the cost of each job saved in the production of chemical fibers in the European Union (as compared with the free trade situation) was about €526,000 or about $683,800 (€580 million divided by the 1,103 jobs saved). Note the high cost of tariff protection to EU consumers even for relatively unimportant products and the very high cost of preserving each job in EU import-competing industries.

(continued)

CASE STUDY 8-4 Continued

TABLE 8.4. Economic Effect of EU Protection on Selected Products

Product	Tariff Equivalent (%)	Consumer Cost (million €)	Tariff Revenue (million €)	Producer Gain (million €)	Dead-weight Cost (million €)	Consumer Costs per Job (thousand €)
Chemical fibers	22.9	580	362	139	79	526
Videocassettes	30.2	313	165	82	67	420
Integrated circuits	47.6	2,187	548	139	564	366
Photocopiers	33.7	314	242	5	66	3,483
Steel	21.9	1,626	229	397	333	316
Passenger cars	17.1	2,101	979	278	276	569
Textiles	21.4	7,096	1,742	2,678	668	180
Clothing	31.3	7,103	1,696	1,712	1,079	214

Source: P. A. Messerlin, *Measuring the Cost of Protection in Europe* (Washington, D.C.: Institute for International Economics, 2001), pp. 46–47, 54–55.

a balance-of-payments effect, but this is discussed in Section 18.6, after we have examined the concept and measurement of the balance of payments.)

The above are the partial equilibrium effects of a tariff in a small nation (i.e., a nation that does not affect commodity prices by its trading). The partial equilibrium effects of a tariff imposed by a large nation are more complex to analyze and are presented for the more advanced student in Section A8.1 of the appendix.

8.3 The Theory of Tariff Structure

So far, we have discussed the nominal tariff on imports of a final commodity. We now extend the partial equilibrium analysis of the previous section to define, measure, and examine the importance of the rate of effective protection. This is a relatively new concept developed only since the 1960s but widely used today.

8.3A The Rate of Effective Protection

Very often, a nation imports a raw material duty free or imposes a lower tariff rate on the importation of the input than on the importation of the final commodity produced with the imported input. The nation usually does this in order to encourage domestic processing and employment. For example, a nation may import wool duty free but impose a tariff on the importation of cloth in order to stimulate the domestic production of cloth and domestic employment.

When this is the case, the rate of effective protection (calculated on the domestic value added, or processing, that takes place in the nation) exceeds the nominal tariff rate (calculated on the value of the final commodity). Domestic value added equals the price of the final commodity minus the cost of the imported inputs going into the production of the commodity. While the nominal tariff rate is important to consumers (because it indicates by how much the price of the final commodity increases as a result of the tariff), the effective tariff rate is important to producers because it indicates how much protection is actually provided to the domestic processing of the import-competing commodity. An example will clarify the distinction between the nominal and effective tariff rates.

Suppose that \$80 of imported wool goes into the domestic production of a suit. Suppose also that the free trade price of the suit is \$100 but the nation imposes a 10 percent nominal tariff on each imported suit. The price of suits to domestic consumers would then be \$110. Of this, \$80 represents imported wool, \$20 is domestic value added, and \$10 is the tariff. The \$10 tariff collected on each imported suit represents a 10 percent nominal tariff rate since the nominal tariff is calculated on the price of the final commodity (i.e., \$10/\$100 = 10 percent) but corresponds to a 50 percent effective tariff rate because the effective tariff is calculated on the value added domestically to the suit (i.e., \$10/\$20 = 50 percent).

While consumers are only concerned with the fact that the \$10 tariff increases the price of the suits they purchase by \$10 or 10 percent, producers view this \$10 tariff as being 50 percent of the \$20 portion of the suit produced domestically. To them, the \$10 tariff provides 50 percent of the value of domestic processing. This represents a much greater degree of protection (five times more) than the 10 percent nominal tariff rate seems to indicate. It is this effective rate of tariff protection that is important to producers in stimulating the domestic production of suits in competition with imported suits. Whenever the imported input is admitted duty free or a lower tariff rate is imposed on the imported input than on the final commodity produced with the imported input, the effective rate of protection will exceed the nominal tariff rate.

The rate of effective protection is usually calculated by the following formula (derived in the appendix):

$$g = \frac{t - a_i t_i}{1 - a_i} \tag{8-1}$$

where g = the rate of effective protection to producers of the final commodity
t = the nominal tariff rate on consumers of the final commodity
a_i = the ratio of the cost of the imported input to the price of the final commodity in the absence of tariffs
t_i = the nominal tariff rate on the imported input

In the preceding suit example, $t = 10$ percent or 0.1, $a_i = \$80/\$100 = 0.8$, and $t_i = 0$. Thus,

$$g = \frac{0.1 - (0.8)(0)}{1.0 - 0.8} = \frac{0.1 - 0}{0.2} = \frac{0.1}{0.2} = 0.5 \text{ or } 50\% \text{ (as found above)}$$

If a 5 percent nominal tariff is imposed on the imported input (i.e., with $t_i = 0.05$), then

$$g = \frac{0.1 - (0.8)(0.05)}{1.0 - 0.8} = \frac{0.1 - 0.04}{0.2} = \frac{0.06}{0.2} = 0.3 \text{ or } 30\%$$

If $t_i = 10$ percent instead,

$$g = \frac{0.1 - (0.8)(0.1)}{1.0 - 0.8} = \frac{0.1 - 0.08}{0.2} = \frac{0.02}{0.2} = 0.1 \text{ or } 10\% \text{ (and equals } t\text{)}$$

With $t_i = 20$ percent,

$$g = \frac{0.1 - (0.8)(0.2)}{1.0 - 0.8} = \frac{0.1 - 0.16}{0.2} = \frac{-0.06}{0.2} = -0.3 \text{ or } -30\%$$

8.3B Generalization and Evaluation of the Theory of Effective Protection

From examining Equation (8-1) and the results obtained with it, we can reach the following important conclusions on the relationship between the rate of effective protection *(g)* and the nominal tariff rate *(t)* on the final commodity:

1. If $a_i = 0$, $g = t$.
2. For given values of a_i and t_i, g is larger the greater is the value of t.
3. For given values of t and t_i, g is larger the greater is the value of a_i.
4. The value of g exceeds, is equal to, or is smaller than t, as t_i is smaller than, equal to, or larger than t (see the first three examples above).
5. When $a_i t_i$ exceeds t, the rate of effective protection is negative (see the last example above).

Note that a tariff on imported inputs is a tax on domestic producers that increases their costs of production, reduces the rate of effective protection provided by a given nominal tariff on the final commodity, and therefore discourages domestic production. In some cases (see conclusion 5 above), even with a positive nominal tariff on the final commodity, less of the commodity is produced domestically than would be under free trade.

Clearly, the nominal tariff rate can be very deceptive and does not give even a rough idea of the degree of protection actually provided to domestic producers of the import-competing product. Furthermore, most industrial nations have a “cascading” tariff structure with very low or zero nominal tariffs on raw materials and higher and higher rates the greater is the degree of processing (see Case Study 8-5). This “tariff escalation” makes the rate of effective protection on a final commodity with imported inputs much greater than the nominal tariff rate would indicate. Case Study 8-6 shows that the highest rates in developed nations are often found on simple labor-intensive commodities, such as textiles, in which developing nations have a comparative advantage and, as such, are of crucial importance to their development. (These questions will be analyzed in detail in Chapter 11).

The concept of effective protection must be used cautiously, however, because of its partial equilibrium nature. Specifically, the theory assumes that the international prices of the commodity and of imported inputs are not affected by tariffs and that inputs are used in fixed proportions in production. Both assumptions are of doubtful validity. For example, when the price of an imported input rises for domestic producers as a result of an import

CASE STUDY 8-5 Rising Tariff Rates with Degree of Domestic Processing

Figure 8.4 shows that industrial countries imposed an average import tariff of about 2.1 percent on raw materials, 5.3 percent on semimanufactures, and 9.1 percent on finished products before the completion of the Uruguay Round in 1993. Although average tariff rates on imports at all stages of processing have fallen during the past decade as a result of the implementation of the Uruguay Round, the figure shows that the cascading tariff structure or the tariff escalation with the stage of processing remains. Thus, the effective rate of protection exceeds the nominal tariff rate by larger percentages, the greater the degree of domestic processing.

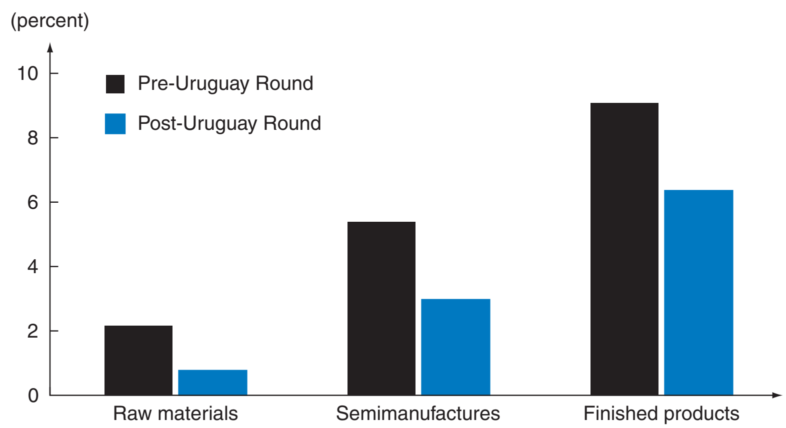

FIGURE 8.4. Pre- and Post-Uruguay Round Cascading Tariff Structure in Industrial Countries.
Source: W. Martin and L. A. Winters, *The Uruguay Round* (Washington, D.C.: World Bank, 1995), p. 11.

CASE STUDY 8-6 Structure of Tariffs on Industrial Products in the United States, the European Union, Japan, and Canada

Table 8.5 gives the post-Uruguay Round tariff levels on imports of raw materials, semimanufactures, and finished products in the United States, the European Union, Japan, and Canada. Transport equipment, nonelectrical machinery, electrical machinery, and other manufactured goods have the single tariff levels indicated in Table 8.1 (independently of the stage of processing), and so they are not included in Table 8.5. The table shows the cascading tariff structure on many industrial products imported in the leading developed countries. The increase in the tariff with the stage of processing is greatest on imports of textiles and clothing, leather, rubber, and travel goods. It is also prevalent in metals, fish, and fish products (except for Japan), and in mineral products (except for Canada). For chemicals, wood, pulp, paper, and furniture, the situation is mixed. The tariff structure in other developed countries is similar.

(continued)

CASE STUDY 8-6 Continued

TABLE 8.5. Cascading Tariff Structure on Imports of Industrial Products in the United States, European Union, Japan, and Canada in 2000 (percentages)

Product	United States: Raw Materials	United States: Semi-manufactures	United States: Finished Products	European Union: Raw Materials	European Union: Semi-manufactures	European Union: Finished Products
Wood, pulp, paper, and furniture	0.0	0.7	0.7	0.0	1.0	0.5
Textiles and clothing	2.8	9.1	9.1	2.6	6.6	9.7
Leather, rubber, and travel goods	0.0	2.3	11.7	0.1	2.4	7.0
Metals	0.8	1.1	2.9	0.0	1.2	2.8
Chemicals and photo supplies	0.0	4.1	2.3	0.0	5.2	3.4
Mineral products	0.6	1.3	5.3	0.0	2.4	3.7
Fish and fish products	0.7	1.7	4.0	11.2	13.3	14.1

Product	Japan: Raw Materials	Japan: Semi-manufactures	Japan: Finished Products	Canada: Raw Materials	Canada: Semi-manufactures	Canada: Finished Products
Wood, pulp, paper, and furniture	0.1	1.9	0.6	0.2	0.9	1.9
Textiles and clothing	2.6	5.9	8.3	2.5	11.1	14.5
Leather, rubber, and travel goods	0.1	10.4	20.7	0.3	5.7	10.3
Metals	0.0	1.0	0.9	0.1	1.7	5.2
Chemicals and photo supplies	0.0	2.9	1.0	0.0	4.7	3.9
Mineral products	0.2	0.5	1.8	2.7	1.0	4.4
Fish and fish products	5.2	10.4	7.9	0.6	0.3	4.6

Source: World Trade Organization, *Market Access: Unfinished Business* (Geneva: WTO, 2001), pp. 36–39.

tariff, they are likely to substitute cheaper domestic or imported inputs in production. Despite these shortcomings, the rate of effective protection is definitely superior to the nominal tariff rate in estimating the degree of protection actually granted to domestic producers of the import-competing product and played a crucial role during the Uruguay Round trade negotiations (discussed in Section 9.6B).

Equation (8-1) can easily be extended to the case of more than one imported input subject to different nominal tariffs. This is done by using the sum of $a_i t_i$ for each imported input in the numerator and the sum of a_i for each imported input in the denominator of the formula. (It is this more general formula that is actually derived in the appendix; the case of a single imported input is a simpler special case.)

8.4 General Equilibrium Analysis of a Tariff in a Small Country

In this section, we use general equilibrium analysis to study the effects of a tariff on production, consumption, trade, and welfare when the nation is too small to affect world prices by its trading. In the next section, we relax this assumption and deal with the more realistic and complex case where the nation is large enough to affect world prices by its trading.

8.4A General Equilibrium Effects of a Tariff in a Small Country

When a very small nation imposes a tariff, it will not affect prices on the world market. However, the domestic price of the importable commodity will rise by the full amount of the tariff for individual producers and consumers in the small nation.

Although the price of the importable commodity rises by the full amount of the tariff for *individual* producers and consumers in the small nation, its price remains constant for the *small nation as a whole* since the nation itself collects the tariff. For example, if the international price of importable commodity X is $1 per unit and the nation imposes a 100 percent ad valorem tariff on imports of commodity X, domestic producers can compete with imports as long as they can produce and sell commodity X at a price no higher than $2. Consumers will have to pay $2 per unit of commodity X, whether imported or domestically produced. (We assume throughout that the imported commodity and the domestically produced commodity are identical.) However, since the nation itself collects the $1 tariff on each unit of commodity X imported, the price of commodity X remains $1 as far as the nation as a whole is concerned.

The divergency between the price of the importable commodity for individual producers and consumers (which includes the tariff) and the price for the nation as a whole (which excludes the tariff and remains the same as the world price) is crucial for the graphical analysis in Section 8.4B. We further assume that the government of the small tariff-imposing nation uses the tariff revenue to subsidize public consumption (such as schools, police, etc.) and/or for general income tax relief. That is, the government of the small nation will need to collect less taxes internally to provide basic services by using the tariff revenue.

8.4B Illustration of the Effects of a Tariff in a Small Country

We will illustrate the general equilibrium effects of a tariff by continuing to utilize our familiar Nation 1 and Nation 2 from previous chapters. We start by using Nation 2's production frontier because it is somewhat more convenient for the type of analysis that we need to perform now. The same analysis for Nation 1 is left as an end-of-chapter problem. The only conclusion that we need to remember from previous chapters is that Nation 2 is the capital-abundant nation specializing in the production of commodity Y (the capital-intensive commodity), which it exports in exchange for imports of commodity X.

From Figure 8.5, we see that if $P_X/P_Y = 1$ on the world market and Nation 2 is too small to affect world prices, it produces at point B, exchanges 60Y for 60X with the rest

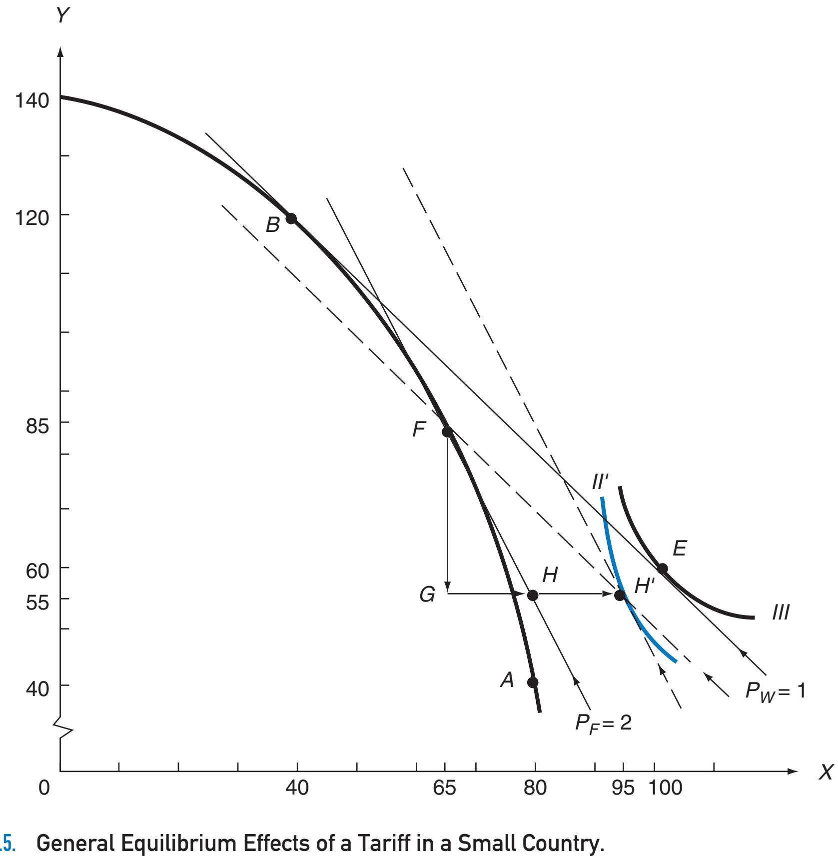

FIGURE 8.5. General Equilibrium Effects of a Tariff in a Small Country.
At $P_X/P_Y = 1$ on the world market, the small nation produces at point B and consumes at point E (as in the right panel of Figure 3.4). With a 100 percent ad valorem tariff on imports of commodity X, $P_X/P_Y = 2$ for individuals in the nation, production takes place at point F, and the nation exports 30Y (FG) for 30X, of which 15X (HH') is collected by the government as a tariff. Since we assume that the government redistributes the tariff revenue in full to its citizens, consumption with the tariff takes place on indifference curve II′ at point H', where the two dashed lines cross. Thus, free trade consumption and welfare (point E) are superior to consumption and welfare with the tariff (point H').

of the world, and consumes at point E on its indifference curve III with free trade. (For convenience, we now omit the prime that we attached to all letters on the graphs for Nation 2 in previous chapters.)

If the nation now imposes a 100 percent ad valorem tariff on imports of commodity X, the relative price of X rises to $P_X/P_Y = 2$ for domestic producers and consumers but remains at $P_X/P_Y = 1$ on the world market and for the nation as a whole (since the nation itself collects the tariff). Facing $P_X/P_Y = 2$, domestic producers will produce at point F, where price line $P_F = 2$ is tangent to the nation's production frontier. Thus, the nation produces more of importable commodity X and less of exportable commodity Y after imposition of the tariff than under free trade (compare point F to point B). The figure also shows that for exports of FG, or 30Y, the nation demands imports of GH', or 30X, of which GH, or 15X, goes directly to the nation's consumers and HH' (i.e., the remaining 15X) is collected in kind by the government in the form of the 100 percent import tariff on commodity X.

Note that indifference curve II′ is tangent to the dashed line parallel to $P_F = 2$ because individual consumers in the nation face the tariff-inclusive price of $P_X/P_Y = 2$. However, since the government collects and *redistributes* the tariff in the form of public consumption and/or tax relief, indifference curve II′ must also be on the dashed line parallel to $P_W = 1$ (since the nation as a whole still faces the world price of $P_X/P_Y = 1$). Thus, the new consumption point H' is defined by the intersection of the two dashed lines (and therefore is on both). The angle between the two dashed lines (which is equal to the angle between price lines $P_W = 1$ and $P_F = 2$) is equal to the tariff *rate* of 100 percent. With production at point F and consumption at point H', the nation exports 30Y for 30X after imposition of the tariff (as opposed to 60Y for 60X before imposition of the tariff).

To summarize, the nation produces at point B with free trade and exports 60Y for 60X at $P_W = 1$. With the 100 percent import tariff on commodity X, $P_X/P_Y = 2$ for individual producers and consumers in the nation but remains at $P_W = 1$ on the world market and for the nation as a whole. Production then takes place at point F; thus, more of importable commodity X is produced in the nation with the tariff than under free trade. 30Y is exchanged for 30X, of which 15X is collected in kind by the government of the nation in the form of a 100 percent import tariff on commodity X. Consumption takes place at point H' on indifference curve II′ after imposition of the tariff. This is below the free trade consumption point E on indifference curve III because, with the tariff, specialization in production is less and so are the gains from trade.

With a 300 percent import tariff on commodity X, $P_X/P_Y = 4$ for domestic producers and consumers, and the nation would return to its autarky point A in production and consumption (see Figure 8.5). Such an import tariff is called a prohibitive tariff. The 300 percent import tariff on commodity X is the *minimum ad valorem rate* that would make the tariff prohibitive in this case. Higher tariffs remain prohibitive, and the nation would continue to produce and consume at point A.

8.4C The Stolper–Samuelson Theorem

The Stolper–Samuelson theorem postulates that an increase in the relative price of a commodity (for example, as a result of a tariff) raises the return or earnings of the factor used intensively in the production of the commodity. Thus, the real return to the nation's scarce factor of production will rise with the imposition of a tariff. For example, when

Nation 2 (the K-abundant nation) imposes an import tariff on commodity X (its L-intensive commodity), P_X/P_Y rises for domestic producers and consumers, and so will the real wage of labor (Nation 2's scarce factor).

The reason for this is that as P_X/P_Y rises as a result of the import tariff on commodity X, Nation 2 will produce more of commodity X and less of commodity Y (compare point F with point B in Figure 8.5). The expansion in the production of commodity X (the L-intensive commodity) requires L/K in a higher proportion than is released by reducing the output of commodity Y (the K-intensive commodity). As a result, w/r rises and K is substituted for L so that K/L rises in the production of both commodities. (This is shown graphically in Section A8.3 in the appendix.) As each unit of L is now combined with more K, the productivity of L rises, and therefore, w rises. Thus, imposition of an import tariff on commodity X by Nation 2 increases P_X/P_Y in the nation and increases the earnings of L (the nation's scarce factor of production).

Since the productivity of labor increases in the production of both commodities, not only the money wage but also the real wage rises in Nation 2. With labor fully employed before and after imposition of the tariff, this also means that the total earnings of labor and its share of the national income are now greater. Since national income is reduced by the tariff (compare point H' to point E in Figure 8.5), and the share of total income going to L is higher, the interest rate and the total earnings of K fall in Nation 2. Thus, while the small nation as a whole is harmed by the tariff, its scarce factor benefits at the expense of its abundant factor (refer to Section 5.5c).

For example, when a small industrial and K-abundant nation, such as Switzerland, imposes a tariff on the imports of an L-intensive commodity, w rises. That is why labor unions in industrial nations generally favor import tariffs. However, the reduction in the earnings of the owners of capital exceeds the gains of labor so that the nation as a whole loses. The Stolper–Samuelson theorem is always true for small nations and is usually true for large nations as well. However, for large nations the analysis is further complicated by the fact that they affect world prices by their trading.

8.5 General Equilibrium Analysis of a Tariff in a Large Country

In this section, we extend our general equilibrium analysis of the production, consumption, trade, and welfare effects of a tariff to the case of a nation large enough to affect international prices by its trading.

8.5A General Equilibrium Effects of a Tariff in a Large Country

To analyze the general equilibrium effects of a tariff in a large nation, it is more convenient to utilize offer curves. When a nation imposes a tariff, its offer curve shifts or rotates toward the axis measuring its importable commodity by the amount of the import tariff. The reason is that for any amount of the export commodity, importers now want sufficiently more of the import commodity to also cover (i.e., pay for) the tariff. The fact that the nation is large is reflected in the trade partner's (or rest of the world's) offer curve having some curvature rather than being a straight line.

Under these circumstances, imposition of a tariff by a large nation reduces the volume of trade but improves the nation's terms of trade. The reduction in the volume of trade, by itself, tends to reduce the nation's welfare, while the improvement in its terms of trade tends to increase the nation's welfare. Whether the nation's welfare actually rises or falls depends on the net effect of these two opposing forces. This is to be contrasted to the case of a small country imposing a tariff, where the volume of trade declines but the terms of trade remain unchanged so that the small nation's welfare always declines.

8.5B Illustration of the Effects of a Tariff in a Large Country

The imposition by Nation 2 of a 100 percent ad valorem tariff on its imports of commodity X is reflected in Nation 2's offer curve rotating to offer curve 2′ in Figure 8.6. Note that tariff-distorted offer curve 2′ is at every point 100 percent or twice as distant from the Y-axis as offer curve 2. (Compare, for example, point H' to point H and point E' to point D in the figure.)

Before imposition of the tariff, the intersection of offer curve 2 and offer curve 1 defined equilibrium point E, at which Nation 2 exchanged 60Y for 60X at $P_X/P_Y = P_W = 1$. After imposition of the tariff, the intersection of offer curve 2′ and offer curve 1 defines the new equilibrium point E', at which Nation 2 exchanges 40Y for 50X at the new world price of $P_X/P_Y = P'_W = 0.8$. Thus, the terms of trade of Nation 1 (the rest of the world) deteriorated

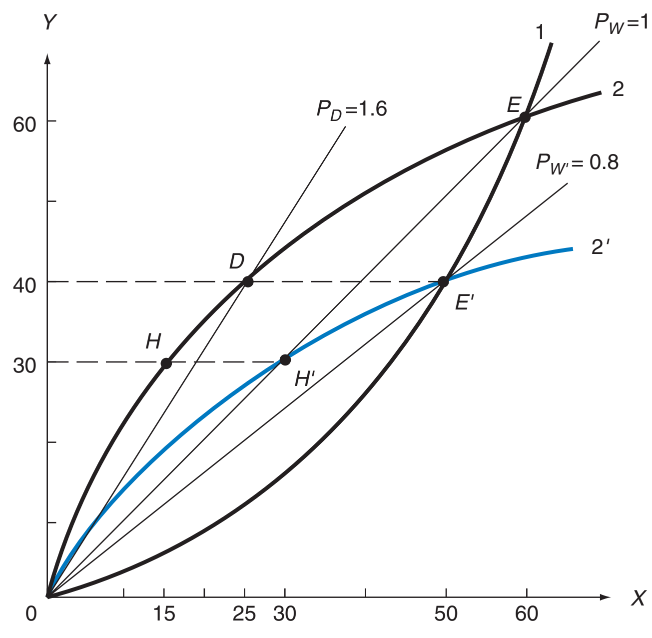

FIGURE 8.6. General Equilibrium Effects of a Tariff in a Large Country.
Free trade offer curves 1 and 2 define equilibrium point E and $P_X/P_Y = 1$ in both nations. A 100 percent ad valorem import tariff on commodity X by Nation 2 rotates its offer curve to 2′, defining the new equilibrium point E'. At point E' the volume of trade is less than under free trade and $P_X/P_Y = 0.8$. This means that Nation 2's terms of trade improved to $P_Y/P_X = 1.25$. The change in Nation 2's welfare depends on the net effect from the higher terms of trade but lower volume of trade. However, since the government collects half of the imports of commodity X as tariff, P_X/P_Y for individuals in Nation 2 rises from $P_X/P_Y = 1$ under free trade to $P_X/P_Y = P_D = 1.6$ with the tariff.

from $P_X/P_Y = P_W = 1$ to $P_X/P_Y = P'_W = 0.8$. On the other hand, Nation 2's terms of trade improved from $P_Y/P_X = 1/P_W = 1$ to $P_Y/P_X = 1/P'_W = 1/0.8 = 1.25$. Note that for any tariff *rate*, the steeper or less elastic Nation 1's (or the rest of the world's) offer curve is, the more its terms of trade deteriorate and Nation 2's improve.

Thus, when large Nation 2 imposes a tariff, the volume of trade declines but its terms of trade improve. Depending on the net effect of these two opposing forces, Nation 2's welfare can increase, decrease, or remain unchanged. This is to be contrasted to the previous case where Nation 2 was assumed to be a small nation and did not affect world prices by its trading. In that case, Nation 1's (or the rest of the world's) offer curve would be represented by straight line $P_W = 1$ in Figure 8.6. Nation 2's imposition of the 100 percent import tariff on commodity X then reduces the volume of trade from 60Y for 60X under free trade to 30Y for 30X with the tariff, at unchanged $P_W = 1$ (compare point E to point H' in Figure 8.6 and Figure 8.5). As a result, the welfare of (small) Nation 2 always declines with a tariff.

Returning to our present case where Nation 2 is assumed to be large, we have seen in Figure 8.6 that with tariff-distorted offer curve 2′, Nation 2 is in equilibrium at point E' by exchanging 40Y for 50X so that $P_Y/P_X = P'_W = 0.8$ on the world market and for Nation 2 as a whole. However, of the 50X imported by Nation 2 at equilibrium point E', 25X is collected in kind by the government of Nation 2 as the 100 percent import tariff on commodity X and only the remaining 25X goes directly to individual consumers. As a result, for individual consumers and producers in Nation 2, $P_X/P_Y = P_D = 1.6$, or twice as much as the price on the world market and for the nation as a whole (see the figure).

Since the relative price of importable commodity X rises for individual consumers and producers in Nation 2, the Stolper–Samuelson theorem also holds (and w rises) when we assume that Nation 2 is large. Only in the unusual case where P_X/P_Y falls for individual consumers and producers after the nation imposes a tariff will the theorem not hold and w fall in Nation 2. This is known as the Metzler paradox and is discussed in Section A8.4 in the appendix.

Also to be pointed out is that the Stolper–Samuelson theorem refers to the long run when all factors are mobile between the nation's industries. If one of the two factors (say, capital) is immobile (so that we are in the short run), the effect of a tariff on factors' income will differ from that postulated by the Stolper–Samuelson theorem and is examined in Section A8.5 of the appendix with the specific-factors model.

8.6 The Optimum Tariff

In this section, we examine how a *large* nation can increase its welfare over the free trade position by imposing a so-called optimum tariff. However, since the gains of the nation come at the expense of other nations, the latter are likely to retaliate, and in the end all nations usually lose.

8.6A The Meaning of the Concept of Optimum Tariff and Retaliation

As we saw in Section 8.5B and Figure 8.6, when a large nation imposes a tariff, the volume of trade declines but the nation's terms of trade improve. The decline in the volume of trade, by itself, tends to reduce the nation's welfare. On the other hand, the improvement in its terms of trade, by itself, tends to increase the nation's welfare.

The optimum tariff is that rate of tariff that maximizes the net benefit resulting from the improvement in the nation's terms of trade against the negative effect resulting from reduction in the volume of trade. That is, starting from the free trade position, as the nation increases its tariff rate, its welfare increases up to a maximum (the optimum tariff) and then declines as the tariff rate is raised past the optimum. Eventually the nation is pushed back toward the autarky point with a prohibitive tariff.

However, as the terms of trade of the nation imposing the tariff improve, those of the trade partner deteriorate, since they are the inverse, or reciprocal, of the terms of trade of the tariff-imposing nation. Facing both a lower volume of trade and deteriorating terms of trade, the trade partner's welfare definitely declines. As a result, the trade partner is likely to retaliate and impose an optimum tariff of its own. While recapturing most of its losses with the improvement in its terms of trade, retaliation by the trade partner will definitely reduce the volume of trade still further. The first nation may then itself retaliate. If the process continues, all nations usually end up losing all or most of the gains from trade.

Note that even when the trade partner does not retaliate when one nation imposes the optimum tariff, the gains of the tariff-imposing nation are less than the losses of the trade partner, so that the world as a whole is worse off than under free trade. It is in this sense that free trade maximizes world welfare.

8.6B Illustration of the Optimum Tariff and Retaliation

Figure 8.7 repeats free trade offer curves 1 and 2 from Figure 8.6, defining equilibrium point E at $P_W = 1$. Suppose that with the optimum tariff, Nation 2's offer curve rotates to 2^*. (Why the tariff associated with offer curve 2^* is an optimum tariff will be explained in Section A8.6 in the appendix.) If Nation 1 does not retaliate, the intersection of offer curve 2^* and offer curve 1 defines the new equilibrium point E^*, at which Nation 2 exchanges 25Y for 40X so that $P_X/P_Y = P_W^* = 0.625$ on the world market and for Nation 2 as a whole. As a result, Nation 1's (the rest of the world's) terms of trade deteriorate from $P_X/P_Y = P_W = 1$ to $P_X/P_Y = P_W^* = 0.625$, and Nation 2's terms of trade improve to $P_Y/P_X = 1/P_W^* = 1/0.625 = 1.6$.

With the tariff associated with offer curve 2^*, not only does the improvement in Nation 2's welfare resulting from its improved terms of trade exceed the reduction in welfare due to the decline in volume of trade, but it represents the highest welfare that Nation 2 can achieve with a tariff (and exceeds its free trade welfare). (Again, the reason why the tariff associated with offer curve 2^* is the optimum tariff will be explained in Section A8.6 in the appendix by utilizing the trade indifference curves derived in Section A4.1 in the appendix to Chapter 4. Here we simply examine the effect of the optimum tariff on the nation imposing it and on its trade partner.)

However, with deteriorated terms of trade and a smaller volume of trade, Nation 1 is definitely worse off than under free trade. As a result, Nation 1 is likely to retaliate and impose an optimum tariff of its own, shown by offer curve 1^*. With offer curves 1^* and 2^*, equilibrium moves to point E^{**}. Now Nation 1's terms of trade are higher and Nation 2's are lower than under free trade, but the volume of trade is much smaller. At this point, Nation 2 is itself likely to retaliate, and in the end both nations may end up at the origin of Figure 8.7, representing the autarky position for both nations. By so doing, all of the gains from trade are lost.

Note that we have been implicitly discussing the optimum *import* tariff. More advanced treaties show, however, that an optimum import tariff is equivalent to an optimum *export*

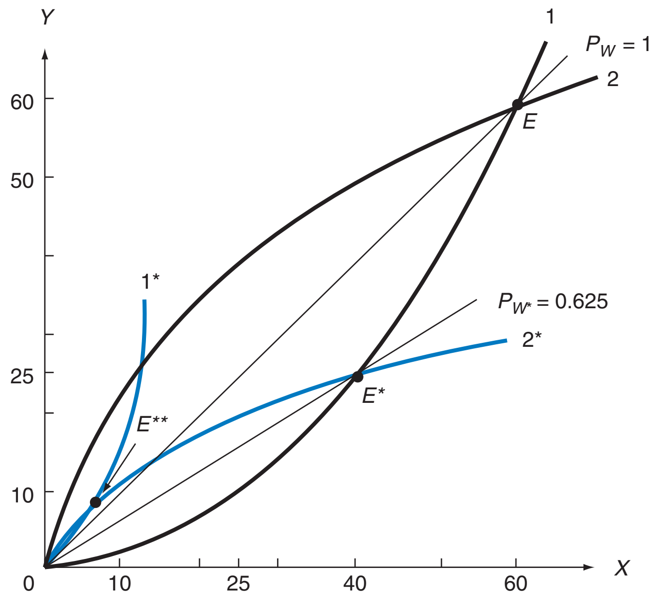

FIGURE 8.7. The Optimum Tariff and Retaliation.
Offer curves 1 and 2 define free trade equilibrium point E and $P_X/P_Y = 1$, as in Figure 8.6. If the optimum tariff for Nation 2 rotates its offer curve to 2*, Nation 2's terms of trade improve to $P_X/P_Y = 1/P'_W = 1/0.625 = 1.6$. At equilibrium point E^*, Nation 2 is at its highest possible welfare and is better off than at the free trade equilibrium point E. However, since Nation 1's welfare is reduced, it is likely to retaliate with an optimum tariff of its own, shown by offer curve 1* and equilibrium at point E^{**}. Nation 2 may then itself retaliate so that in the end both nations are likely to lose all or most of the benefits from trade.

tariff. Finally, note that the optimum tariff for a small country is zero, since a tariff will not affect its terms of trade and will only cause the volume of trade to decline (see points E and H' in Figure 8.6). Thus, no tariff can increase the small nation's welfare over its free trade position even if the trade partner does not retaliate. Finally, recent empirical research by *Broda, Limao, and Weinstein* (2008) indicates that nations do indeed impose higher tariffs on goods with lower export elasticity (i.e., in which the nations have more market power).

SUMMARY

1. Although free trade maximizes world welfare, most nations impose some trade restrictions that benefit special groups in the nation. The most important type of trade restriction historically is the tariff. This is a tax or duty on imports or exports. The *ad valorem tariff* is expressed as a percentage of the value of the traded commodity, whereas the specific tariff is a fixed sum per unit. The two are sometimes combined into a compound tariff. The most common is the ad valorem import tariff. These have generally declined over the past 50 years and today average only about 3 percent on manufactured goods in industrial nations.

2. Partial equilibrium analysis of a tariff utilizes the nation's demand and supply curves of the importable commodity and assumes that the domestic price of the importable commodity rises by the full amount of the tariff. It measures the reduction in domestic

consumption, increase in domestic production, reduction in imports, the revenue collected, and redistribution of income from domestic consumers (who pay a higher price for the commodity) to domestic producers (who receive a higher price) as a result of the tariff. A tariff leads to inefficiencies referred to as protection cost or deadweight loss.

3. The appropriate measure of the degree of protection actually provided to domestic producers is given by the rate of effective protection *(g)*. This usually differs widely from the nominal tariff rate *(t)*, and g can even be negative for a positive value of t. The two rates are equal only when the nominal rate on imported inputs equals the nominal rate on the final commodity or if there are no imported inputs. Rates of effective protection in industrial nations are generally much higher than the corresponding nominal rates and are higher the more processed the product. These calculations, however, must be used cautiously because of their partial equilibrium nature.

4. When a small nation imposes an import tariff, the domestic price of the importable commodity rises by the full amount of the tariff for individuals in the nation. As a result, domestic production of the importable commodity expands while domestic consumption and imports fall. However, the nation as a whole faces the unchanged world price since the nation itself collects the tariff. These general equilibrium effects of a tariff can be analyzed with the trade models developed in Part One and by assuming that the nation redistributes the tariff revenue fully to its citizens in the form of subsidized public consumption and/or general income tax relief.

5. According to the Stolper–Samuelson theorem, an increase in the relative price of a commodity (for example, as a result of a tariff) raises the return or earnings of the factor used intensively in its production. For example, if a capital-abundant nation imposes an import tariff on the labor-intensive commodity, wages in the nation will rise.

6. When a large nation imposes an import tariff, its offer curve rotates toward the axis measuring its importable commodity by the amount of the tariff, reducing the volume of trade but improving the nation's terms of trade. The optimum tariff is one that maximizes the net benefit resulting from improvement in the nation's terms of trade against the negative effect resulting from reduction in the volume of trade. However, since the nation's benefit comes at the expense of other nations, the latter are likely to retaliate, so that in the end all nations usually lose.

A LOOK AHEAD

Chapter 9 extends our discussion to nontariff trade restrictions, such as quotas and new forms of protection, that have increased substantially during the past three decades. The chapter then goes on to examine the political economy of protectionism and strategic trade and industrial policies. Finally, the chapter reviews the history of U.S. commercial policies and presents an overview of the provisions of the Uruguay Round and of the outstanding trade problems remaining in the world today.

KEY TERMS

Ad valorem tariff, p. 222
Compound tariff, p. 222
Consumer surplus, p. 225
Consumption effect of a tariff, p. 224
Domestic value added, p. 230
Export tariff, p. 221
Import tariff, p. 221
Metzler paradox, p. 239
Nominal tariff, p. 229
Optimum tariff, p. 240
Production effect of a tariff, p. 224
Prohibitive tariff, p. 236
Protection cost or deadweight loss of a tariff, p. 227
Rate of effective protection, p. 229
Rent or producer surplus, p. 226
Revenue effect of a tariff, p. 224
Specific tariff, p. 222
Stolper–Samuelson theorem, p. 236
Trade effect of a tariff, p. 224
Trade or commercial policies, p. 221

QUESTIONS FOR REVIEW

1. What is meant by an ad valorem, a specific, and a compound tariff? Are import or export tariffs more common in industrial nations? in developing nations?
2. What is the primary function of tariffs in industrial nations? in developing nations?
3. When is partial equilibrium analysis of a tariff justified? How is this performed?
4. What is meant by the consumption, production, trade, revenue, and redistribution effects of a tariff?
5. What is meant by the protection cost, or deadweight loss, of a tariff? How is this measured?
6. What is the difference between a nominal tariff and an effective tariff? What is the usefulness of the concept of effective protection? How is the rate of effective protection measured?
7. What is the tariff structure of developed nations? Why is this of special concern to developing nations? What is the most serious shortcoming of the concept and measure of effective protection?
8. Using general equilibrium analysis, indicate the effect of an import tariff imposed by a small nation on the relative commodity price of the importable commodity for individuals in the nation and for the nation as a whole.
9. What is the effect of the tariff on the degree of specialization in production in a small nation? the volume of trade? the welfare of the nation? the distribution of income between the nation's relatively abundant and scarce factors?
10. Using general equilibrium analysis and assuming that a nation is large, indicate the effect of an import tariff on the nation's offer curve, the nation's terms of trade, the volume of trade, the nation's welfare, and the distribution of income between the nation's relatively abundant and scarce factors.
11. What is meant by the optimum tariff? What is its relationship to changes in the nation's terms of trade and volume of trade?
12. Why are other nations likely to retaliate when a nation imposes an optimum tariff (or, for that matter, any import tariff)? What is likely to be the final outcome resulting from the process of retaliation?

PROBLEMS

1. Draw a figure similar to Figure 8.1 for Nation 1 but with the quantity of commodity Y on the horizontal axis and the dollar price of Y on the vertical axis. Draw S_Y for Nation 1, identical to S_X for Nation 2 in Figure 8.1, but draw D_Y for Nation 1 crossing the vertical axis at $P_Y = \$8$ and the horizontal axis at 80Y. Finally, assume that $P_Y = \$1$ under free trade and that Nation 1 then imposes a 100 percent ad valorem import tariff on commodity Y. With regard to your figure, indicate the following for Nation 1:

   (a) The level of consumption, production, and imports of commodity Y at the free trade price of $P_Y = \$1$.

   (b) The level of consumption, production, and imports of commodity Y after Nation 1 imposes the 100 percent ad valorem tariff on commodity Y.

   (c) What are the consumption, production, trade, and revenue effects of the tariff?

2. For the statement of Problem 1:

   (a) Determine the dollar value of the consumer surplus before and after the imposition of the tariff.

   (b) Of the increase in the revenue of producers with the tariff (as compared with their revenues under free trade), how much represents increased production costs? increased rent, or producer surplus?

   (c) What is the dollar value of the protection cost, or deadweight loss, of the tariff?

3. Suppose that a nation reduces import tariffs on raw materials and intermediate products but not on finished products. What effect will this have on the rate of effective protection in the nation?

***4.** Calculate the rate of effective protection when t (the nominal tariff on the final commodity) is 40 percent, a_i (the ratio of the cost of the imported input to the price of the final commodity in the absence of tariffs) is 0.5, and t_i (the nominal tariff on the imported input) is 40 percent.

5. For the given in Problem 4, recalculate g with the following values of t_i:

(a) $t_i = 20$ percent.

(b) $t_i = 0$.

(c) $t_i = 80$ percent.

(d) $t_i = 100$ percent.

6. For the given in Problem 4,

(a) Recalculate g if $t_i = 20$ percent and $a_i = 0.6$.

(b) What general conclusion can you reach about the relationship between g and t from your answer to Problem 4 in Chapter 3 and Problem 6(a) above?

***7.** Starting with the trade model of Figure 3.4 for Nation 1 and assuming that Nation 1 is small, draw a figure analogous to Figure 8.5 showing the general equilibrium effects resulting when Nation 1 imposes a 100 percent ad valorem import tariff on commodity Y, starting from its free trade position. (*Hint*: See Figure 4.3 but assume that, with the tariff, individuals exchange 30X for 15Y, instead of the 40X for 20Y in Figure 4.3.)

*= Answer provided at www.wiley.com/college/salvatore.

***8.** Using the Stolper–Samuelson theorem, indicate the effect on the distribution of income between labor and capital in Nation 1 (assumed to be a small nation) when it imposes an import tariff on commodity Y.

9. Explain the forces at work that lead to the redistribution of income in your answer to Problem 8, in a way analogous to the explanation given in Section 8.4c for the redistribution of income in Nation 2 when that nation imposed an import tariff on commodity X.

10. How would the result in Problem 8 be affected if Nation 1 were instead assumed to be a large nation?

11. Is India more likely to restrict its imports of L-intensive or K-intensive commodities? Why? What effect is this likely to have on the distribution of income between labor and capital in India?

12. Starting with the free trade offer curves of Nation 1 and Nation 2 in Figure 8.6 and building on your figure in Problem 1, draw a figure analogous to Figure 8.6 showing the general equilibrium effects of the 100 percent ad valorem import tariff on commodity Y imposed by Nation 1, now assumed to be a large nation.

13. Draw a figure analogous to Figure 8.7 for Nation 1 showing that with the optimum tariff Nation 1 will trade 25X for 40Y and also showing the effect of Nation 2 retaliating with an optimum tariff of its own.

14. What happens if the two nations retaliate against each other's optimum tariff several times?

APPENDIX

This appendix examines the partial equilibrium effects of a tariff in a large nation, derives the formula for the rate of effective protection, analyzes graphically the Stolper–Samuelson theorem and its exception, examines the short-run effect of a tariff on factors' income, and shows the measurement of the optimum tariff.

A8.1 Partial Equilibrium Effects of a Tariff in a Large Nation

In Section 8.2, we examined the partial equilibrium effects of a tariff in a small nation (i.e., one that does not affect commodity prices by its trading). We now extend the analysis to

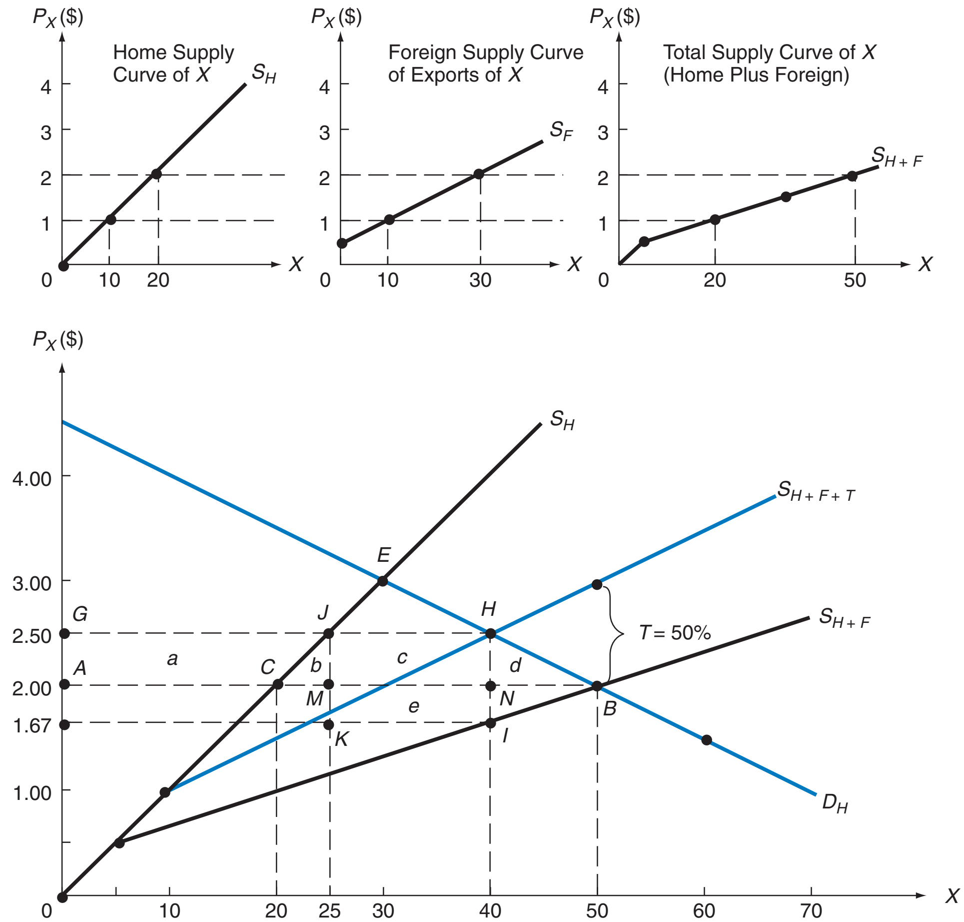

FIGURE 8.8. Partial Equilibrium Effects of a Tariff in a Large Nation.
In the top panel, S_H is the *domestic* supply, S_F is the *foreign* supply, and S_{H+F} is the *total* supply of X to the nation. With free trade, D_H (the home demand for X) intersects S_{H+F} at B (in the bottom panel) so that P_X = \$2 and $Q_X = AB = 50$ ($AC = 20$X supplied domestically and $CB = 30$X by foreigners). With a 50 percent ad valorem import tariff, S_{H+F} shifts up to S_{H+F+T}. D_H intersects S_{H+F+T} at H and P_X = \$2.50 and $Q_X = GH$ = 40 ($GJ = 25$X supplied domestically and $JH = 15$X by foreigners). The loss of consumer surplus is area $a + b + c + d$ = \$22.50, of which a = \$11.25 is the higher rent of domestic producers, c = \$7.50 is the tariff revenue collected from domestic consumers, and $b + d$ = \$3.75 is the protection cost or deadweight loss to the nation. Since the nation also collects $MNIK = e$ = \$4.95 from exporters, the nation receives a net gain of \$1.20 from the tariff.

examine the partial equilibrium effects of a tariff imposed by a large nation. This is done by using Figure 8.8, which is similar to but more complex than Figure 8.3.

In the top panel of Figure 8.8, S_H is the home or *domestic* supply curve of commodity X in the *large* nation, S_F is the *foreign* supply curve of exports of commodity X to the nation, and S_{H+F} is the total supply curve of commodity X to the nation. S_{H+F} is obtained as the (lateral) summation of the home supply curve, S_H, and S_F, the foreign supply curve of exports of commodity X to the nation. For example, at $P_X = \$1$, 10X will be supplied domestically and 10X from abroad, for a total of 20X. At $P_X = \$2$, 20X will be supplied domestically and 30X from abroad, for a total of 50X. The S_F curve is positively sloped (rather than horizontal, as in the small-nation case in Figure 8.1) because the large nation must pay higher prices to induce foreigners to supply more exports of commodity X to the nation.

In the bottom panel of Figure 8.8, we see that *with free trade*, D_H (the home demand curve for commodity X in the nation) intersects S_{H+F} (the same as in the top panel, except for being drawn on a larger scale) at point B, so that $P_X = \$2$ and $Q_X = AB = 50$ (of which $AC = 20$X are supplied by domestic producers and $CB = 30$X by foreigners). If the nation now imposes a 50 percent ad valorem import tariff *(T)* on commodity X, the total supply curve will shift up by 50 percent and becomes S_{H+F+T}. Now D_H intersects S_{H+F+T} at point H, so that $P_X = \$2.50$ and $Q_X = GH = 40$ (of which $GJ = 25$X are supplied by domestic producers and $JH = 15$X by foreigners).

The loss of consumer surplus resulting from the tariff is equal to area $a + b + c + d =$ \$22.50, of which $a = \$11.25$ is the higher rent received by domestic producers, $c = \$7.50$ is the tariff revenue collected by the nation's government from domestic consumers, and the remainder (the sum of triangles $b + d = \$3.75$) is the protection cost or deadweight loss to the nation.

The nation's government, however, also collects $IKMN = e = (\$0.33)(15) = \$4.95$ from foreign exporters. The reason for this is that by increasing P_X, the tariff reduces consumption and imports of commodity X in the nation, and since the nation is large, the smaller quantity of exports will be supplied at a lower price. Specifically, with the tariff domestic consumers pay \$2.50 (as compared with $P_X = \$2.00$ under free trade), whereas foreign exporters receive only $P_X = \$1.67$ (instead of \$2.00 under free trade). Thus, foreign exporters share the burden of the tariff with domestic consumers. Now that the nation is large, the tariff will lower the price of imports to the nation as a whole (i.e., the nation receives a terms-of-trade benefit from the tariff).

The protection cost or deadweight loss to the nation from the tariff must now be balanced against the terms-of-trade benefit that the nation receives. Since in this case the terms-of-trade benefit to the nation of \$4.95 (e) exceeds the protection cost of the tariff of \$3.75 ($b + d$), the nation receives a net benefit of \$1.20 ($e - b - d$) from the tariff. If the terms-of-trade benefit equaled the protection cost, the nation would neither gain nor lose from the tariff. Finally, if the terms-of-trade benefit were smaller than the protection cost, the nation would lose. Note that a small nation always incurs a net loss from a tariff equal to the protection cost or deadweight loss because the small nation does not affect foreign export or world prices (so that $e = 0$).

Even if, as in the above example, the nation gains from the tariff, the terms-of-trade benefit to the nation represents a loss to foreigners. As a result, foreigners are likely to retaliate with a tariff of their own, so that in the end both nations are likely to lose from the reduced level of trade and international specialization (see the discussion of the optimum tariff in Section 8.6).

Problem What is the relationship between the price elasticity of S_H and S_F and the price of the commodity under free trade and with the specific tariff?

A8.2 Derivation of the Formula for the Rate of Effective Protection

The rate of effective protection measures the percentage increase in domestic value added as a result of tariffs and is given by

$$g = \frac{V' - V}{V} \tag{8A-1}$$

where g is the rate of effective protection, V is the domestic value added under free trade, and V' equals the domestic value added with a tariff on imports of the final commodity and/or on imported inputs used in the domestic production of the commodity.

We now want to derive Equation (8-1) in Section 8.3A from Equation (8A-1). This is accomplished by defining V and V' in terms of the international price of the final commodity under free trade and with tariffs, substituting these values into Equation (8A-1), and simplifying to get Equation (8-1).

Suppose that the fixed international free trade price of a commodity (for example, a suit) is p (so that we are dealing with a small nation). Suppose also that a number of imported inputs (such as wool, buttons, etc.), also fixed in price on the world market, go into the domestic production of suits. The sum of the costs of these imported inputs going into the domestic production of a suit under free trade is

$$a_1 p + a_2 p + \ldots a_n p = \sum a_i p \tag{8A-2}$$

where i refers to any of the n imported inputs and $a_i p$ is the cost of imported input i going into the domestic production of a suit.

Thus, the domestic value added in a suit produced in the nation under free trade equals the international fixed price of the suit under free trade minus the cost of all imported inputs at their fixed international free trade price. That is,

$$V = p - p\sum a_i = p\left(1 - \sum a_i\right) \tag{8A-3}$$

With a tariff on suit imports and on imported inputs going into the domestic production of suits, the domestic value added (V') is

$$V' = p(1+t) - p\sum a_i(1+t_i) \tag{8A-4}$$

where t is the nominal ad valorem tariff rate on suit imports and t_i is the nominal ad valorem tariff rate on the imported input i going into the domestic production of suits. Note that t_i may differ for different imported inputs.

Substituting the values from Equation (8A-3) and Equation (8A-4) into Equation (8A-1), we get

$$g = \frac{V' - V}{V} = \frac{p(1+t) - p\sum a_i(1+t_i) - p\left(1 - \sum a_i\right)}{p\left(1 - \sum a_i\right)}$$

Since there is a p in each term in the numerator and denominator, we can cancel them out, and by also removing the parentheses, we get

$$g = \frac{1 + t - \sum a_i - \sum a_i t_i - 1 + \sum a_i}{1 - \sum a_i}$$

Canceling out equal terms in the numerator, we get Equation (8A-5):

$$g = \frac{t - \sum a_i t_i}{1 - \sum a_i} \tag{8A-5}$$

If there is only one imported input going into the production of the commodity, the "$\sum$" sign is removed from the numerator and the denominator of Equation (8A-5) and we end up with Equation (8-1) given in Section 8.3.

A shortcoming of the theory of effective protection is that it assumes technologically fixed coefficients of production (i.e., no factor substitution is possible) and that the international prices of the imported commodity and imported inputs are not affected by tariffs (i.e., the nation is a small nation).

Problem (a) What effect will the imposition of a tariff on imported inputs going into the domestic production of a commodity have on the size of the consumption, production, trade, revenue, and redistribution effects of the tariff on the final commodity? (b) What effect will it have on the size of the protection cost, or deadweight loss, of the tariff? (*Hint*: Determine which curve shifts and in which direction in Figure 8.1 as a result of the tariff on imported inputs.)

A8.3 The Stolper–Samuelson Theorem Graphically

According to the Stolper–Samuelson theorem (see Section 8.4C), the real return to the nation's scarce factor of production will rise with the imposition of a tariff. For example, when Nation 2 (the K-abundant nation) imposes an import tariff on commodity X (its L-intensive commodity), P_X/P_Y rises for domestic producers and consumers, and so will the real wage of labor (Nation 2's scarce factor).

The rise in P_X/P_Y and the resulting expansion of the output of commodity X and contraction of the output of commodity Y when Nation 2 imposes an import tariff on commodity X are clearly shown in Figure 8.5. Here we want to show that the tariff also results in an increase in K/L in the production of both commodities and thus increases the wage of labor (the nation's scarce factor), as postulated by the Stolper–Samuelson theorem.

To do this, we utilize the Edgeworth box diagram for Nation 2 in Figure 8.9 (from Figures 3.10 and 5.6, but omitting the prime on the letters). In Figure 8.9, point A is the autarky production point, point B is the free trade production point, and point F is the production point with 100 percent import tariff on commodity X. Note that point F is farther away from origin O_X and closer to origin O_Y than point B, indicating that with the rise in P_X/P_Y as a result of the import tariff on commodity X, Nation 2 produces more of commodity X and less of commodity Y.

The slope of the *solid* line from origin O_X to point B measures K/L in the production of commodity X, and the slope of the *solid* line from origin O_Y to point B measures K/L in the production of commodity Y under *free trade*. With production at point F (after the

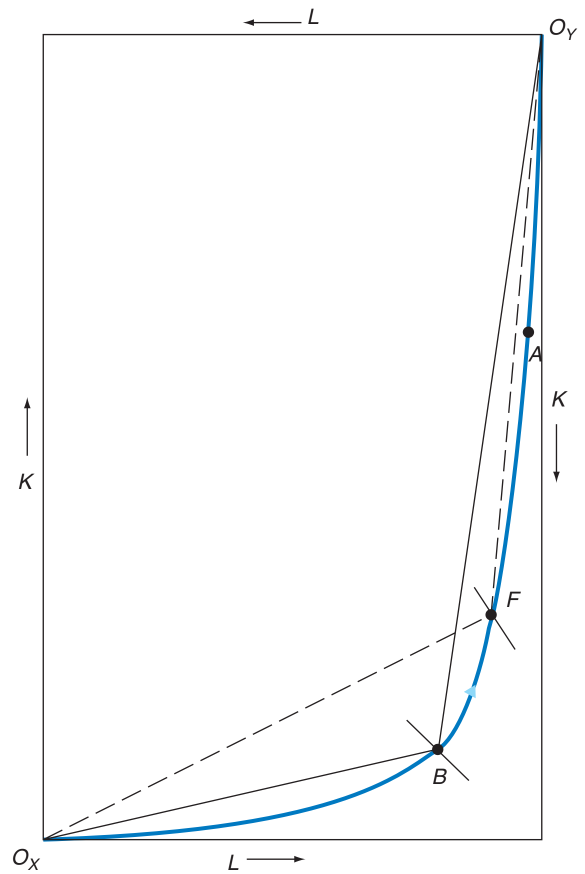

FIGURE 8.9. The Stolper–Samuelson Theorem Graphically.
When Nation 2 imposes an import tariff on commodity X, P_X/P_Y rises and the nation moves from free trade point *B* to point *F* on its production contract curve and produces more of commodity X but less of commodity Y. Since both *dashed* lines from the origins to point *F* are steeper than both *solid* lines from the origins to point *B, K/L* is higher in the production of both commodities with the tariff than under free trade. As more capital is used per unit of labor, the productivity of labor rises, and therefore the income of labor is higher after the tariff is levied, as postulated by the theorem.

import tariff on commodity X), *K/L* in the production of commodity X and commodity Y is measured by the slope of the *dashed* lines from origins O_X and O_Y, respectively, to point F. Since the dashed line from each origin is steeper than the solid line (see the figure), *K/L* is higher in the production of both commodities after the imposition of the import tariff on commodity X than under free trade.

As each unit of labor is combined with more capital in the production of both commodities after the tariff on commodity X, the productivity of labor increases, and therefore the wage rate rises in the production of both commodities. This is reflected in the fact that the absolute slope of the short solid line through point F (measuring *w/r*) is greater than the absolute slope of the short solid line through point B. With the assumption of perfect competition in factor markets, wages will be equalized in the production of both commodities.

Problem Utilizing the Edgeworth box diagram for *Nation 1* in the top panel of Figure 3.9 and in Figure 5.6, show that a 100 percent import tariff on commodity Y alters production from point B to point F, reduces *K/L* in the production of both commodities, and thus increases the productivity and income of capital in Nation 1.

A8.4 Exception to the Stolper–Samuelson Theorem—The Metzler Paradox

In the unusual case where a tariff lowers rather than raises the relative price of the importable commodity to individuals in the nation, the income of the nation's scarce factor also falls, and the Stolper–Samuelson theorem no longer holds. To examine this case (discovered by Metzler), we first look at the left panel of Figure 8.10, where the theorem *does* hold. This is identical to Figure 8.6 except that now we deal with an *export* rather than an import tariff because this makes the graphical analysis more straightforward.

The left panel of Figure 8.10 shows that *individual* exporters in Nation 2 must export 55Y, of which 15Y ($D'E'$) is collected in kind by their government in the form of an *export* tariff and the remaining 40Y goes to foreigners in exchange for 50X. As a result, $P_X/P_Y = P'_D = 1.1$ for individuals in Nation 2 with the tariff, as opposed to $P_X/P_Y = P_W = 1$ under free trade.

Note that the rise in P_X/P_Y for individuals in Nation 2 would be greater if the shift from offer curve 2 to 2′ was due to an import rather than an export tariff (see $P_D = 1.6$ in

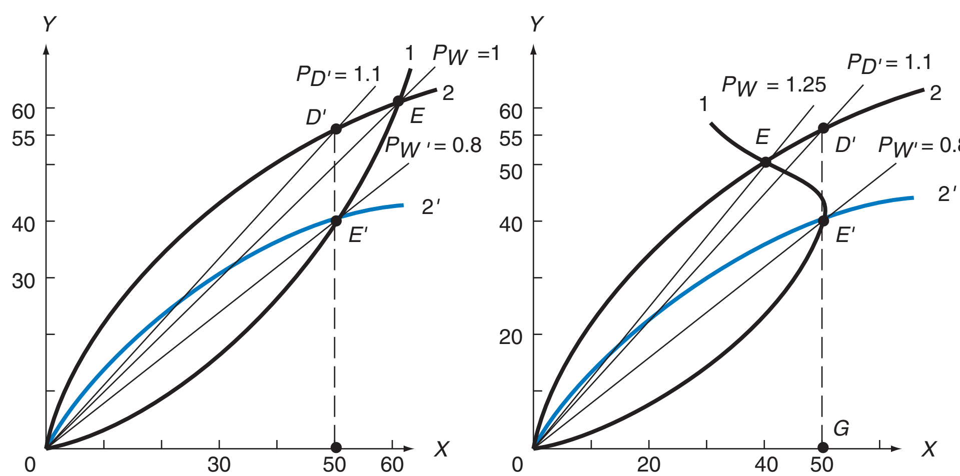

FIGURE 8.10. The Metzler Paradox.
The left panel shows that when Nation 2 imposes an export tariff, the relative price of commodity X falls to $P_X/P_Y = 0.8$ for the nation as a whole but rises to $P_X/P_Y = 1.1$ for individuals (because of the tariff) as compared with free trade $P_X/P_Y = 1$. Since P_X/P_Y rises for individuals in Nation 2, Nation 2 produces more of commodity X (the L-intensive commodity) and the income of labor rises, so that the Stolper–Samuelson theorem holds. In the right panel, free trade $P_X/P_Y = 1.25$ (at point E) and the same export tariff by Nation 2 results in $P_X/P_Y = 1.1$ for individuals in Nation 2. Since P_X/P_Y falls for individuals when Nation 2 imposes a tariff, the income of labor falls. Thus, the Stolper–Samuelson theorem no longer holds, and we have the Metzler paradox. This results because Nation 1's offer curve bends backward or is inelastic past point E, in the right panel.

Figure 8.6), but what is important for the Stolper–Samuelson theorem to hold is only that P_X/P_Y rises for individuals in Nation 2. The reason for this is that when P_X/P_Y rises, *whether from an import or export tariff*, L and K are transferred from the production of commodity Y to the production of commodity X, *K/L* rises in the production of both commodities, and so will the productivity and the income of labor (exactly as described in Section A8.3).

Only in the unusual case where Nation 1's (or the rest of the world's) offer curve bends backward and becomes negatively inclined or inelastic after a point (as in the right panel in Figure 8.10) may P_X/P_Y fall rather than rise for individuals in Nation 2 (compared with the free trade equilibrium price). In that case, the Stolper–Samuelson theorem would no longer hold. Specifically, the right panel of Figure 8.10 shows that at the free trade equilibrium point E (given by the intersection of offer curves 1 and 2), $P_W = 1.25$. The imposition of the export tariff by Nation 2 rotates offer curve 2 to 2′, giving equilibrium point E' with $P'_W = 0.8$ for Nation 2 as a whole and the rest of the world. However, individuals in Nation 2 will have to pay the export tariff of 15Y ($D'E'$) so that $P_X/P_Y = P_{D'} = 1.1$ for individuals in Nation 2.

Since the imposition of the export tariff reduces P_X/P_Y for individuals in Nation 2 (from $P_X/P_Y = 1.25$ under free trade to $P_X/P_Y = 1.1$ with the export tariff), the Stolper–Samuelson theorem no longer holds. That is, the fall in P_X/P_Y as Nation 2 imposes a tariff causes Nation 2 to produce less of commodity X and more of commodity Y. Since commodity Y is the K-intensive commodity, *K/L* falls in the production of both commodities, and so will the productivity and income of labor (Nation 2's scarce factor). This is the opposite of what the Stolper–Samuelson theorem postulates and is known as the Metzler paradox.

The Metzler paradox, however, is unusual. A necessary and sufficient condition for its occurrence is that the other nation's (or the rest of the world's) offer curve bends backward or is inelastic over the range of the tariff and that all of the export tariff collected by the government is spent on consumption of the importable commodity.

Problem Draw a figure analogous to Figure 8.10 showing in the left panel that the Stolper–Samuelson theorem holds *when Nation 1 imposes an export tariff* and showing the Metzler paradox in the right panel.

A8.5 Short-Run Effect of a Tariff on Factors' Income

The Stolper–Samuelson theorem refers to the long run when all factors are mobile between the nation's industries. Suppose, however, that labor is mobile but some capital is specific to the production of commodity X and some capital is specific to the production of commodity Y, so that we are in the short run. The short-run effect of a tariff on factors' income differs from that postulated by the Stolper–Samuelson theorem for the long run and can be analyzed with the use of the specific-factors model developed in Section A5.4.

Suppose we examine the case of Nation 2 (the K-abundant nation), which exports commodity Y (the K-intensive commodity) and imports commodity X. In Figure 8.11, distance OO' refers to the total supply of labor available to Nation 2 and the vertical axes measure the wage rate. Under free trade, the equilibrium wage rate is ED in both industries of Nation 2 and is determined by the intersection of the $VMPL_X$ and $VMPL_Y$ curves. OD of labor is used in the production of commodity X and DO' in the production of Y.

If Nation 2 now imposes a tariff on the importation of commodity X so that P_X rises in Nation 2, the $VMPL_X$ curve shifts upward proportionately, say, to $VMPL'_X$. This increases the wage rate from ED to $E'D'$, and DD' units of labor are transferred from the production

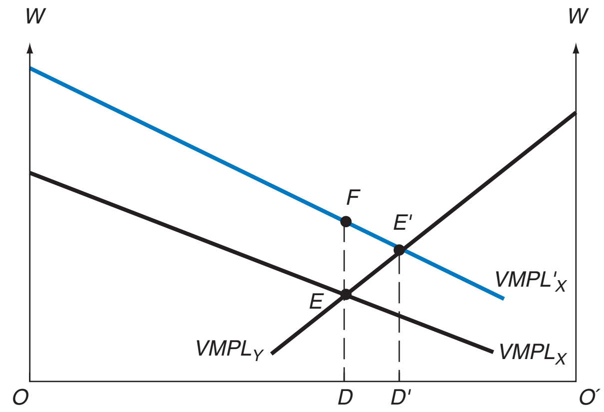

FIGURE 8.11. Short-Run Effect of Tariff on Factors' Income.
An import tariff imposed by Nation 2 (K abundant) usually increases P_X and shifts the $VMPL_X$ curve upward to $VMPL'_X$. The wage rate increases less than proportionately, and DD' of labor (the nation's mobile factor) is transferred from the production of Y to the production of X. The real wage falls in terms of X but rises in terms of Y. The real return of capital (the nation's immobile factor) rises in terms of X but falls in terms of Y.

of commodity Y to the production of commodity X. Since w increases by less than the increase in P_X, w falls in terms of X but rises in terms of Y (since P_Y is unchanged).

Since the specific capital in the production of commodity X has more labor to work with, the real $VMPK_X$ and r increase in terms of both commodities X and Y. On the other hand, since less labor is used with the fixed capital in the production of commodity Y, $VMPK_Y$ and r fall in terms of commodity X, and therefore in terms of commodity Y as well.

Thus, the imposition of an import tariff on commodity X by Nation 2 (the K-abundant nation) leads to the real income of labor (the mobile factor) falling in terms of X and rising in terms of Y in both industries of Nation 2, and to the real income and return to capital (the immobile factor) rising in the production of X and falling in the production of Y. These results are to be contrasted with those obtained by the Stolper–Samuelson theorem when both labor and capital are mobile, which postulates that an import tariff increases real w and reduces real r in the K-abundant nation (our Nation 2).

Problem What effect on real w and r will the imposition of an import tariff on commodity Y (the K-intensive commodity) have in Nation 1 (the L-abundant nation) if labor is mobile but capital is not?

A8.6 Measurement of the Optimum Tariff

In Section 8.6A, we defined the optimum tariff as that rate of tariff that maximizes the net benefit resulting from the improvement in the nation's terms of trade against the negative effect resulting from the reduction in the volume of trade. The reason offer curve 2^* in Figure 8.7 is associated with the optimum tariff for Nation 2 is that point E^* is on the *highest trade indifference curve* that Nation 2 can achieve with any tariff. This is shown by TI in Figure 8.12, which is otherwise identical to Figure 8.7.

Trade indifference curves were derived for Nation 1 in Section A4.1. Other trade indifference curves for Nation 2 have the same general shape as TI in Figure 8.12 but are either to the left of *TI* (and therefore refer to a lower welfare for Nation 2) or to the right of *TI* (and, as such, are superior to *TI* but cannot be reached by Nation 2).

Thus, the optimum tariff is the tariff rate that makes the nation reach its highest trade indifference curve possible. This is the trade indifference curve that is tangent to the trade partner's offer curve. Thus, *TI* is tangent to Nation 1's (or the rest of the world's) offer curve. To reach *TI* and point E^*, Nation 2 must impose that import or export tariff that rotates its offer curve from 2 to 2^*.

Nation 2 can cause its offer curve to rotate from 2 to 2^* by imposing a 100 percent ad valorem export tariff on commodity Y. Specifically, at equilibrium point E^*, Nation 2's exporters will export 50Y (JN), of which 25Y (JE^*) is collected by the government of Nation 2 as an export tax on commodity Y, and the remainder of 25Y (E^*N) goes to foreigners in exchange for 40X. Note that Nation 2 could also get its offer curve to rotate from 2 to 2^* with a seemingly much larger import tariff on commodity X. In reality, the optimum export tariff *rate* is equal to the optimum import tariff rate (even though this does not seem so in Figure 8.12). This can be proved adequately only with mathematics in more advanced graduate texts.

However, since it is more likely for a nation to have some monopoly power over its exports (for example, Brazil over coffee exports and petroleum-exporting countries over petroleum exports through OPEC) than it is for a nation to have some monopsony power

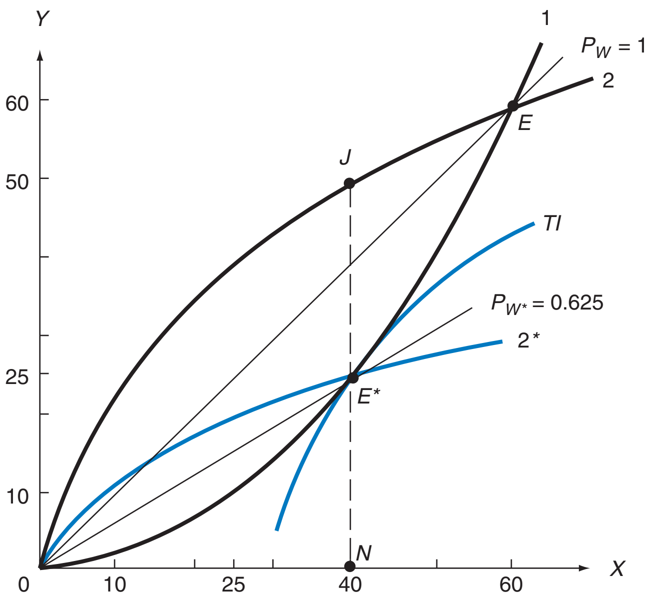

FIGURE 8.12. Measurement of the Optimum Tariff.
Offer curve 2^* is associated with the optimum tariff rate for Nation 2 because equilibrium point E^* is on the highest trade indifference curve Nation 2 can reach. This is given by *TI*, which is tangent to Nation 1's offer curve. Nation 2 can get to equilibrium point E^* on *TI* by imposing a 100 percent ad valorem export tariff (since $JE^* = E^*N$). Nation 2 cannot reach a trade indifference curve higher than *TI*. On the other hand, any tariff other than the optimum rate of 100 percent will put the nation on a trade indifference curve lower than *TI*.

over its imports, our discussion of the optimum tariff is perhaps more relevant in terms of exports than imports.

The optimum export or import tariff rate (t^*) can also be calculated with the following formula:

$$t^* = \frac{1}{e - 1} \tag{8A-6}$$

where e is the (absolute value of the) elasticity of the trade partner's offer curve. Thus, when e is infinite (i.e., when the trade partner's offer curve is a straight line, which also means that Nation 2 is a small nation), then the optimum tariff for Nation 2 is zero (see the formula). On the other hand, when Nation 1's (or the rest of the world's) offer curve has some curvature (so that e is less than infinite), t^* has a positive value. The lower is the value of e (i.e., the greater is the curvature of the trade partner's offer curve), the greater is the value of t^*. However, formula 8A-6 is not very operational because in order to use it to calculate the optimum tariff, we must first identify point E^* (see Figure 8.12).

As pointed out in Section 8.6B, the gain to a nation from the optimum tariff comes at the expense of the trade partner, who is likely to retaliate. The process of retaliation may continue until in the end both nations lose all or most of the gains from trade. The volume of trade may shrink to zero unless, by coincidence, both nations happen to be imposing their optimum tariff *simultaneously*, given the trade partner's tariff.

Problem (a) Draw a figure analogous to Figure 8.12 showing the optimum export tariff on commodity X *for Nation 1. (Hint*: For the general shape of Nation 1's trade indifference curves, see Figure 4.8.) Can you show on the same figure the optimum tariff for Nation 2 after Nation 1 has already imposed its optimum tariff? (*Hint*: See Figure 8.7.) (b) What are the approximate terms of trade of Nation 1 and Nation 2 after Nation 1 has imposed an optimum tariff and Nation 2 has retaliated with an optimum tariff of its own? (c) How has the welfare of each nation changed from the free trade position?

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http://www.gpoaccess.gov/eop

http://www.state.gov

http://www.ustr.gov

http://www.usitc.gov

For international trade policies around the world, see the Internet site of the World Trade Organization (WTO), the European Union, and the Canadian Department of Foreign Affairs, respectively, at:

http://www.wto.org

http://mkaccdb.eu.int

http://www.infoexport.gc.ca

chapter 9

Nontariff Trade Barriers and the New Protectionism

LEARNING GOALS:

After reading this chapter, you should be able to:

- **Know the meaning and effect of quotas and other nontariff trade barriers**
- **Describe the effect of dumping and export subsidies**
- **Explain the political economy of protectionism and strategic and industrial policies**
- **Describe the effect of the Uruguay Round and the aims of the Doha Round**

9.1 Introduction

Although tariffs have historically been the most important form of trade restriction, there are many other types of trade barriers, such as import quotas, voluntary export restraints, and antidumping actions. As tariffs were negotiated down during the postwar period, the importance of nontariff trade barriers was greatly increased.

In this chapter, we analyze the effect of nontariff trade barriers. Section 9.2 examines the effects of an import quota and compares them to those of an import tariff. Section 9.3 deals with other nontariff trade barriers and includes a discussion of voluntary export restraints and other regulations, as well as trade barriers resulting from international cartels, dumping, and export subsidies. In Section 9.4, the various arguments for protection are presented, from the clearly fallacious ones to those that seem to make some economic sense. Section 9.5 examines strategic trade and industrial policies. Section 9.6 briefly surveys the history of U.S. commercial or trade policy from 1934 to the present. Finally, Section 9.7 summarizes the outcome of the Uruguay Round of trade negotiations, discusses the launching of the Doha Round, and identifies the outstanding trade problems facing the world today. The appendix analyzes graphically the operation of centralized cartels, international price discrimination, and the use of taxes and subsidies instead of tariffs to correct domestic distortions.

9.2 Import Quotas

A quota is the most important nontariff trade barrier. It is a *direct* quantitative restriction on the amount of a commodity allowed to be imported or exported. In this section, we examine import quotas. Export quotas (in the form of voluntary export restraints) are examined in Section 9.3A. An import quota is examined in this section with the same type of partial equilibrium analysis used in Section 8.2 to analyze the effects of an import tariff. The similarities between an import quota and an equivalent import tariff are also noted.

9.2A Effects of an Import Quota

Import quotas can be used to protect a domestic industry, to protect domestic agriculture, and/or for balance-of-payments reasons. Import quotas were very common in Western Europe immediately after World War II. Since then import quotas have been used by practically all industrial nations to protect their agriculture and by developing nations to stimulate import substitution of manufactured products and for balance-of-payments reasons.

The partial equilibrium effects of an import quota can be illustrated with Figure 9.1, which is almost identical to Figure 8.1. In Figure 9.1, D_X is the demand curve and S_X is the supply curve of commodity X for the nation. With free trade at the world price of $P_X = \$1$, the nation consumes 70X *(AB)*, of which 10X *(AC)* is produced domestically and the

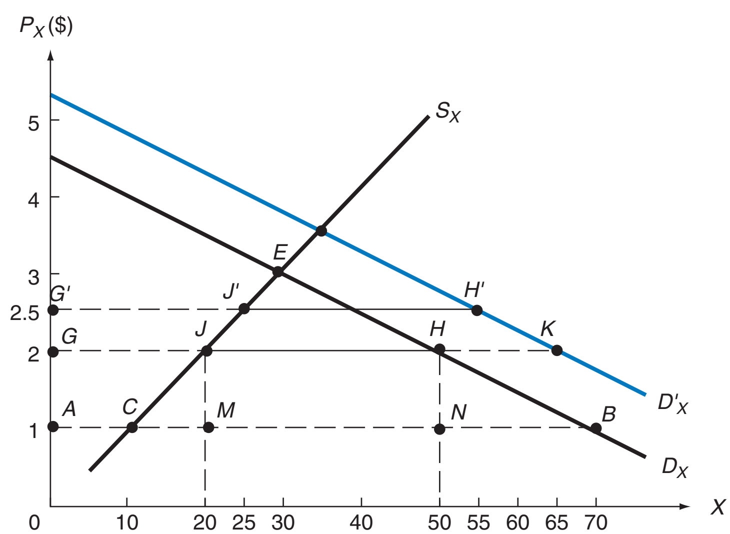

FIGURE 9.1. Partial Equilibrium Effects of an Import Quota.
D_X and S_X represent the nation's demand and supply curves of commodity X. Starting from the free trade $P_X = \$1$, an import quota of 30X *(JH)* would result in $P_X = \$2$ and consumption of 50X *(GH)*, of which 20X *(GJ)* is produced domestically. If the government auctioned off import licenses to the highest bidder in a competitive market, the revenue effect would also be \$30 *(JHNM)*, as with a 100 percent import tariff. With a shift in D_X to D'_X and an import quota of 30X *(J′H′)*, consumption would rise from 50X to 55X *(G′H′)*, of which 25X *(G′J′)* are produced domestically.

remainder of 60X *(CB)* is imported. An import quota of 30X *(JH)* would raise the domestic price of X to $P_X = \$2$, exactly as with a 100 percent ad valorem import tariff on commodity X (see Figure 8.1). The reason is that only at $P_X = \$2$ does the quantity demanded of 50X *(GH)* equal the 20X *(GJ)* produced domestically plus the 30X *(JH)* allowed by the import quota. Thus, consumption is reduced by 20X *(BN)* and domestic production is increased by 10X *(CM)* with an import quota of 30X *(JH)*, exactly as with the 100 percent import tariff (see Case Study 9-1). If the government also auctioned off import licenses to the highest bidder in a competitive market, the revenue effect would be \$30 (\$1 on each of the 30X of the import quota), given by area *JHNM*. Then the import quota of 30X would be equivalent in every respect to an "implicit" 100 percent import tariff.

With an upward shift of D_X to D'_X, the *given import quota* of 30X ($J'H'$) would result in the domestic price of X rising to $P_X = \$2.50$, domestic production rising to 25X ($G'J'$), and domestic consumption rising from 50X to 55X ($G'H'$). On the other hand, with the given 100 percent import tariff (in the face of the shift from D_X to D'_X), the price of X would remain unchanged at $P_X = \$2$ and so would domestic production at 20X *(GJ)*, but domestic consumption would rise to 65X *(GK)* and imports to 45X *(JK)*.

CASE STUDY 9-1 The Economic Effects of the U.S. Quota on Sugar Imports

The United States restricted sugar imports into the United States with a quota of 1.4 million tons per year in 2005. The quota more than doubled the price of sugar to U.S. consumers and led to a loss of consumer surplus of about \$1.7 billion per year (measured by the sum of areas $a + b + c + d$, as indicated in Figure 8.3). Of that amount, \$0.9 billion accrued to U.S. sugar producers in the form of producer surplus (area a in Figure 8.3), \$0.4 billion went to foreign sugar exporters to the United States in the form of the higher price that they received (area c in Figure 8.3), and \$0.4 billion represented the deadweight loss from the production and consumption distortions in the United States as a result of the quota (the sum of areas $b + d$ in Figure 8.3). Thus, the net total loss to the United States as a result of its sugar quota was about \$0.8 billion (the \$1.7 billion loss of consumer surplus minus the gain in producer surplus of \$0.9 billion).

Dividing the total loss of consumer surplus of \$1.7 billion by the 300 million people living in the United States in 2005, meant that on average every American spends about \$6 more on sugar per year than in the absence of the quota. Most Americans, of course, did not know of the quota and would not care much about it since each one spends only a few dollars per year on sugar, but with fewer than 1,000 large sugar producers in the United States, the sugar quota raised their average profits by about \$2 million per year (no wonder American sugar interests lobbied the federal government so strenuously to keep the quota in place!). Since removing the sugar quota is estimated to lead to about 7,000 jobs lost in the U.S. sugar industry in 2005, this meant that the *consumer cost* of each job saved in the U.S. sugar-growing industry was about \$243,000 (the loss of the consumer surplus of \$1.7 billion from the U.S. sugar quota divided by the 7,000 jobs saved). Since 2005 (and to a large extent due to the realization of its high cost), protection of the U.S. sugar industry has declined sharply, and so has its cost and inefficiency.

Sources: USITC, *The Economic Effects of Significant U.S. Import Restraints and Seventh Update,* Washington, D.C., February 2007 and August 2011.

9.2B Comparison of an Import Quota to an Import Tariff

The shift of D_X to D'_X in Figure 9.1 points to one of several important differences between an import quota and an equivalent (implicit) import tariff. That is, with a given import quota, an increase in demand will result in a higher domestic price and greater domestic production than with an equivalent import tariff. On the other hand, with a given import tariff, an increase in demand will leave the domestic price and domestic production unchanged but will result in higher consumption and imports than with an equivalent import quota (see Figure 9.1). A downward shift in D_X as well as shifts in S_X can be analyzed in an analogous manner but are left as end-of-chapter problems. Since adjustment to any shift in D_X or S_X occurs in the domestic *price* with an (effective) import quota but in the *quantity of imports* with a tariff, an import quota completely replaces the market mechanism rather than simply altering it (as an import tariff does).

A second important difference between an import quota and an import tariff is that the quota involves the distribution of import licenses. If the government does not auction off these licenses in a competitive market, firms that receive them will reap monopoly profits. In that case, the government must decide the basis for distributing licenses among potential importers of the commodity. Such choices may be based on arbitrary official judgments rather than on efficiency considerations, and they tend to remain frozen even in the face of changes in the relative efficiency of various actual and potential importers of the commodity. Furthermore, since import licenses result in monopoly profits, potential importers are likely to devote a great deal of effort to lobbying and even bribing government officials to obtain them (in so-called rent-seeking activities). Thus, import quotas not only replace the market mechanism but also result in waste from the point of view of the economy as a whole and contain the seeds of corruption.

Finally, an import quota limits imports to the specified level with *certainty*, while the trade effect of an import tariff may be uncertain. The reason for this is that the shape or elasticity of D_X and S_X is often not known, making it difficult to estimate the import tariff required to restrict imports to a desired level. Furthermore, foreign *exporters* may absorb all or part of the tariff by increasing their efficiency of operation or by accepting lower profits. As a result, the actual reduction in imports may be less than anticipated. Exporters cannot do this with an import quota since the *quantity* of imports allowed into the nation is clearly specified by the quota. It is for this reason, and also because an import quota is less "visible," that domestic producers strongly prefer import quotas to import tariffs. However, since import quotas are more restrictive than equivalent import tariffs, society should generally resist these efforts. As we will see in Section 9.7A, one of the provisions of the Uruguay Round was to change import quotas and other nontariff barriers into equivalent tariffs (a process known as "tariffication").

9.3 Other Nontariff Barriers and the New Protectionism

In this section, we examine trade barriers other than import tariffs and quotas. These include voluntary export restraints and technical, administrative, and other regulations. Trade restrictions also result from the existence of international cartels and from dumping and export subsidies. During the past two decades, these nontariff trade barriers (NTBs), or the new protectionism, have become more important than tariffs as obstructions to the flow of international trade and represent a major threat to the world trading system. In this section, we examine NTBs and the new protectionism, starting with voluntary export restraints.

9.3A Voluntary Export Restraints

One of the most important of the nontariff trade barriers, or NTBs, is voluntary export restraints (VERs). These refer to the case where an importing country induces another nation to reduce its exports of a commodity "voluntarily," under the threat of higher all-around trade restrictions, when these exports threaten an entire domestic industry. Voluntary export restraints have been negotiated since the 1950s by the United States, the European Union, and other industrial nations to curtail exports of textiles, steel, electronic products, automobiles, and other products from Japan, Korea, and other nations. These are the mature industries that faced sharp declines in employment in the industrial countries during the past three decades. Sometimes called "orderly marketing arrangements," these voluntary export restraints have allowed the United States and other industrial nations making use of them to save at least the appearance of continued support for the principle of free trade. The Uruguay Round required the phasing out of all VERs by the end of 1999 and the prohibition on the imposition of new VERs.

When voluntary export restraints are successful, they have all the economic effects of (and therefore can be analyzed in exactly the same way as) equivalent import quotas, except that they are administered by the exporting country, and so the revenue effect or rents are captured by foreign exporters. An example of this is provided by the "voluntary" restraint on Japanese automobile exports to the United States negotiated in 1981 (see Case Study 9-2). The United States also negotiated voluntary export restraints with major steel suppliers in 1982 that limited imports to about 20 percent of the U.S. steel market. It has been estimated that these agreements have saved about 20,000 jobs but raised the price of steel in the United States by 20 to 30 percent. These VERs expired in 1992 but were immediately replaced by

■ CASE STUDY 9-2 Voluntary Export Restraints (VERs) on Japanese Automobiles to the United States and Europe

From 1977 to 1981, U.S. automobile production fell by about one-third, the share of imports rose from 18 to 29 percent, and nearly 300,000 auto workers in the United States lost their jobs. In 1980, the Big Three U.S. automakers (GM, Ford, and Chrysler) suffered combined losses of $4 billion. As a result, the United States negotiated an agreement with Japan that limited Japanese automobile exports to the United States to 1.68 million units per year from 1981 to 1983 and to 1.85 million units for 1984 and 1985. Japan "agreed" to restrict its automobile exports out of fear of still more stringent import restrictions by the United States.

Automakers from the United States generally used the time from 1981 to 1985 wisely to lower breakeven points and improve quality, but the cost improvements were not passed on to consumers, and Detroit reaped profits of nearly $6 billion in 1983, $10 billion in 1984, and $8 billion in 1985. Japan gained by exporting higher-priced autos and earning higher profits. The big loser was

(continued)

CASE STUDY 9-2 Continued

the American public, which had to pay about $660 more for U.S.-made automobiles and $1,300 more for Japanese cars in 1984. The total cost of the agreement to U.S. consumers was estimated to be $15.7 billion from 1981 through 1984 and 44,000 U.S. automakers' jobs were saved at the cost of more than $100,000 each.

Since 1985, the United States has not asked for a renewal of the VER agreement, but Japan unilaterally limited its auto exports (to 2.3 million from 1986 to 1991 and 1.65 million afterward) in order to avoid more trade frictions with the United States. From the late 1980s, Japan invested heavily in producing automobiles in the United States in so-called transplant factories, and by 1996, Japan was producing more than 2 million cars in the United States and had captured 23 percent of the U.S. auto market. By 2008, Japanese automakers' share of the U.S. market had reached 35 percent (between domestic production and imports).

Following the U.S. lead, Canada and Germany also negotiated restrictions on Japanese exports (France and Italy already had very stringent quotas). A 1991 agreement to limit the Japanese share of the European Union's auto market to 16 percent expired at the end of 1999, when the share of Japanese cars (imports and production in Europe) was 11.4 percent of the European market. That share exceeded 13 percent in 2008 and was rising. In the United States, foreign automakers now sell more cars in the United States (imports and U.S. produced) than Detroit's Big Three. In 2009, GM filed for bankruptcy and survived only with $49.5 billion of taxpayer money invested by the U.S. government, giving the U.S. government a 61 percent ownership of the automaker. Chrysler also survived with government help and was subsequently acquired by FIAT of Italy. Despite the weak economy in 2011, U.S. automakers increased production and sales and even took back some market from Japanese producers. In 2010, GM sold more locally produced cars in China than in the United States!

Sources: U.S. International Trade Commission, *A Review of Recent Developments in the U.S. Automobile Industry Including an Assessment of the Japanese Voluntary Restraint Agreements* (Washington, D.C.: February 1985); "Japanese Cars Set Europe Sales Record," *The Japan Times*, January 16, 2005, p. 1; "America's Other Auto Industry," *The Wall Street Journal*, December 1, 2008, p. A22; "The Medicine Starts to Work," *The Economist*, May 22, 2010, p. 69; and "U.S. Automakers Getting Back on Track at Just the Right Time," *Money Morning*, October 11, 2011, p. 1.

industry demands for antidumping duties against foreign steel exporters (see Section 9.3D), which resulted in bitter disputes between the United States, Japan, the European Union, and other nations.

Voluntary export restraints were less effective in limiting imports than import quotas because the exporting nations agree only reluctantly to curb their exports. Foreign exporters also tend to fill their quota with higher-quality and higher-priced units of the product over time. This product upgrading was clearly evident in the case of the Japanese voluntary restraint on automobile exports to the United States. Furthermore, as a rule, only major supplier countries were involved, leaving the door open for other nations to replace part of the exports of the major suppliers and also for transshipments through third countries.

9.3B Technical, Administrative, and Other Regulations

International trade is also hampered by numerous technical, administrative, and other regulations. These include *safety regulations* for automobile and electrical equipment, *health regulations* for the hygienic production and packaging of imported food products, and *labeling requirements* showing origin and contents. Many of these regulations serve legitimate purposes, but some (such as the French ban on scotch advertisements and the British restriction on the showing of foreign films on British television) are only thinly veiled disguises for restricting imports.

Other trade restrictions have resulted from laws requiring governments to buy from domestic suppliers (the so-called government procurement policies). For example, under the "Buy American Act" passed in 1933, U.S. government agencies gave a price advantage of up to 12 percent (50 percent for defense contracts) to domestic suppliers. As part of the Tokyo Round of trade liberalization (see Section 9.6D), the United States and other nations agreed on a government procurement code to bring these practices and regulations into the open and give foreign suppliers a fair chance.

Much attention has also been given in recent years to *border taxes*. These are rebates for internal *indirect taxes* given to exporters of a commodity and imposed (in addition to the tariff) on importers of a commodity. Examples of indirect taxes are excise and sales taxes in the United States and the value-added tax (VAT) in Europe. Since most government revenues are raised through direct taxes (such as income taxes) in the United States and through indirect taxes (such as the value-added tax) in Europe, United States exporters receive much lower rebates than European exporters (or no rebate at all) and are thus at a competitive disadvantage.

International commodity agreements and *multiple exchange rates* also restrict trade. However, as the former are of primary concern to developing nations and the latter relate to international finance, they are discussed in Chapter 11 and Chapter 18, respectively.

9.3C International Cartels

An international cartel is an organization of suppliers of a commodity located in different nations (or a group of governments) that agrees to restrict output and exports of the commodity with the aim of maximizing or increasing the total profits of the organization. Although *domestic* cartels are illegal in the United States and restricted in Europe, the power of *international* cartels cannot easily be countered because they do not fall under the jurisdiction of any one nation.

The most notorious of present-day international cartels is OPEC (Organization of Petroleum Exporting Countries), which, by restricting production and exports, succeeded in quadrupling the price of crude oil between 1973 and 1974. Another example is the International Air Transport Association, a cartel of major international airlines that met annually until 2007 to set international air fares and policies.

An international cartel is more likely to be successful if there are only a few international suppliers of an essential commodity for which there are no close substitutes. OPEC fulfilled these requirements very well during the 1970s. When there are many international suppliers, however, it is more difficult to organize them into an effective cartel. Similarly, when good substitutes for the commodity are available, the attempt by an international cartel to restrict output and exports in order to increase prices and profits will only lead buyers to shift to substitute commodities. This explains the failure of, or inability to set up, international cartels in minerals other than petroleum and tin, and agricultural products other than sugar, coffee, cocoa, and rubber.

Since the power of a cartel lies in its ability to restrict output and exports, there is an incentive for any one supplier to remain outside the cartel or to "cheat" on it by unrestricted sales at slightly below the cartel price. This became painfully evident to OPEC during the 1980s when high petroleum prices greatly stimulated petroleum exploration and production by nonmembers (such as the United Kingdom, Norway, and Mexico). The resulting increase in supply, together with conservation measures that reduced the increase in the demand for petroleum products, led to sharply lower petroleum prices in the 1980s and most of the 1990s as compared to the 1970s. It also showed that, as predicted by economic theory, cartels are inherently unstable and often collapse or fail. If successful, however, a cartel could behave exactly as a monopolist (a centralized cartel) in maximizing its total profits (see Section A9.1).

9.3D Dumping

Trade barriers may also result from dumping. Dumping is the export of a commodity at below cost or at least the sale of a commodity at a lower price abroad than domestically. Dumping is classified as persistent, predatory, and sporadic. Persistent dumping, or international price discrimination, is the *continuous* tendency of a domestic monopolist to maximize total profits by selling the commodity at a higher price in the domestic market (which is insulated by transportation costs and trade barriers) than internationally (where it must meet the competition of foreign producers). Section A9.2 shows how a domestic monopolist can determine the exact prices to charge domestically and internationally to maximize total profits in cases of persistent dumping, or international price discrimination.

Predatory dumping is the *temporary* sale of a commodity at below cost or at a lower price abroad in order to drive foreign producers out of business, after which prices are raised to take advantage of the newly acquired monopoly power abroad. Sporadic dumping is the *occasional* sale of a commodity at below cost or at a lower price abroad than domestically in order to unload an unforeseen and temporary surplus of the commodity without having to reduce domestic prices.

Trade restrictions to counteract *predatory* dumping are justified and allowed to protect domestic industries from unfair competition from abroad. These restrictions usually take the form of *antidumping* duties to offset price differentials, or the threat to impose such duties. However, it is often difficult to determine the type of dumping, and domestic producers invariably demand protection against any form of dumping. By so doing, they discourage imports (the “harassment thesis”) and increase their own production and profits (rents). In some cases of persistent and sporadic dumping, the benefit to consumers from low prices may actually exceed the possible production losses of domestic producers.

Over the past four decades, Japan was accused of dumping steel and television sets in the United States, and European nations of dumping cars, steel, and other products. Many industrial nations, especially those that belong to the European Union, have a tendency to persistently dump agricultural commodities arising from their farm support programs. When dumping is proved, the violating nation or firm usually chooses to raise its prices (as Volkswagen did in 1976 and Japanese TV exporters in 1997) rather than face antidumping duties. In 2007, 29 countries (counting the European Union as a single member) had antidumping laws (including many developing countries).

In 1978, the U.S. government introduced a trigger-price mechanism under which a charge that steel was being imported into the United States at prices below those of the lowest-cost foreign producer (Korea in the late 1980s) was subject to a speedy antidumping investigation. If dumping was proved, the U.S. government would provide quick relief to the domestic steel industry in the form of a duty that would bring the price of the imported steel equal to that of the lowest-cost country. Since 1992, when the voluntary export restraints on steel exports to the United States expired, U.S. steel producers have filed hundreds of antidumping suits against foreign steel producers, resulting in bitter disputes.

In 1985, U.S. producers filed antidumping suits against Japanese exporters of computer chips (the brains of computers and most modern-day machinery). An agreement was reached in 1986 under which Japan would stop dumping chips in the United States and around the world. Charging continued dumping, however, the United States imposed a 100 percent import duty on $300 million worth of Japanese exports to the United States in 1987. The tariff was removed in 1991 when Japan renegotiated the semiconductor agreement, under which Japan agreed to help foreign (U.S.) producers increase their share of the Japanese chip market from 8 percent in 1986 to 20 percent by 1992. Disagreements continued, however, when U.S. chip producers failed to achieve the agreed 20 percent market share in Japan in 1994. In 1996, the agreement was renewed, but it required only that the U.S. and Japanese computer chip industries monitor each other's markets without any market-sharing requirement.

In 1998 and 1999, the United States imposed antidumping duties on steel imports from the European Union, Japan, Korea, Brazil, and Russia, and in March 2002, it imposed a 30 percent duty on steel imports from Russia, Brazil, Japan, and China (which the WTO ruled as illegal and the United States removed in December 2003). In 2010, the WTO upheld the tariffs that the United States imposed in 2008 on Chinese-made steel pipes, tires, and other products to protect U.S. producers against Chinese dumping and government subsidies. Requests for antidumping investigations by the steel industry have been relatively frequent in recent years, notably in the United States, because of chronic excess supply in world markets.

In 2005, the United States negotiated a limit on the increase of Chinese textile and apparel exports to the United States of 7.5 percent per year until 2008 (the European Union did the same with a 10 percent limit until 2008). These restrictions were deemed necessary when the elimination of all quotas on textile and apparel exports in 2004 as part of the implementation of the Uruguay Round led to a flooding of Chinese exports of these products to the United States and the European Union. The long-running banana case, where the United States accused the European Union of restricting banana imports from Central America and the Caribbean (from American-owned plantations), was also settled in 2010 in favor of the United States.

In 2011, the United States asked the WTO to strike down China's heavy antidumping duties on U.S. chicken products; the United States and the European Union set antidumping and antisubsidy duties on Chinese coated paper (used in high-end catalogues and magazines); the United States asked the WTO to review Chinese measures restricting market access to U.S. suppliers of electronic payment services; and China itself imposed punitive duties of up to 22 percent on U.S. exports of SUVs to China.

In March 2012, the United States, Japan, and the European Union requested consultations with China under the dispute settlement system concerning China's restrictions on exports of various forms of rare earths, tungsten, and molybdenum. In May 2012, the U.S. Commerce Department found several Chinese solar-panel companies guilty of dumping and slapped 31 percent tariffs on their exports.

The number of antidumping measures in force rose from 880 in January 1998 to 1,683 in September 2011. On average, about one-half of antidumping investigations were terminated without any measure being taken and the rest ended with the imposition of a duty or with the exporter increasing the price of the export commodity. Case Study 9-3 gives the antidumping investigations initiated in 2010 and 2011 by G20 nations.

9.3E Export Subsidies

Export subsidies are direct payments (or the granting of tax relief and subsidized loans) to the nation's exporters or potential exporters and/or low-interest loans to foreign buyers to stimulate the nation's exports. As such, export subsidies can be regarded as a form of dumping. Although export subsidies are illegal by international agreement, many nations provide them in disguised and not-so-disguised forms.

For example, all major industrial nations give foreign buyers of the nation's exports low-interest loans to finance the purchase through agencies such as the U.S. Export–Import Bank. These low-interest credits finance about 2 percent of U.S. exports but a much larger percentage of Japan's, France's, and Germany's exports. Indeed, this is one of the most serious trade complaints that the United States has against other industrial countries today. The amount of the subsidy provided can be measured by the difference between the interest that would have been paid on a commercial loan and what in fact is paid at the subsidized rate.

CASE STUDY 9-3 Antidumping Investigations by G20 Members

Table 9.1 gives the antidumping investigations initiated by G20 members (the most important developed and developing nations and the European Union) between October 2010 and April 2012. The table shows that the total number of antidumping investigations initiated declined from 78 from October 2010 to April 2011 to 73 from October 2011 to April 2012 (there were 119 in 2009 at the height of the financial crisis). In 2012, Brazil had the largest number (16), followed by the European Union (EU, as a separate entity from its members) with 13, The United States with 12, and India with 12. The other members of the G20 (France, Germany, Italy, Japan, the United Kingdom, Indonesia, and Saudi Arabia) had none in 2010 to 2012. The products on which the most antidumping investigations were initiated were metals, chemicals, plastics, textiles, and machinery.

TABLE 9.1. Antidumping Investigations Initiated in 2010–2012 by G20 Members

G20 Member	Oct. 2010–April 2011	Oct. 2011–April 2012	G20 Member	Oct. 2010–April 2012	Oct. 2010–April 2012
Brazil	25	16	China	4	3
EU	8	13	Turkey	1	3
United States	9	12	Canada	0	3
India	15	8	Mexico	2	2
Argentina	11	4	Korea	0	2
Australia	2	4	Mexico	2	5
Russia	1	4	South Africa	0	1
			Total	78	73

Source: World Trade Organization, *Report on G20 Trade Measures* (Geneva: WTO, May 31, 2012), Table 4.

Another example is the U.S. "extraterritorial income" or Foreign Sales Corporations (FSC) provisions of the U.S. tax code. These have been used since 1971 by some 3,600 U.S. corporations (including Boeing, Microsoft, and Caterpillar) to set up overseas subsidiaries to enjoy partial exemption from U.S. tax laws on income earned from exports. This provision saved American companies about $4 billion in taxes each year. In 1999, the World Trade Organization (WTO) ruled that such tax relief was a form of export subsidy and ordered the United States to repeal it. The United States appealed but lost, and so in 2004 it repealed the FSC scheme or face $4 billion in sanctions. Since the United States did not eliminate all export subsidies, however, the WTO authorized the countries of the European Union to impose sanctions on $300 million of U.S. trade in 2005.

In 2010, the United States filed a case against China for illegally subsidizing the production of wind power equipment. China responded by announcing its own investigation against U.S. government policies and subsidies on renewable energy, wind energy, and solar and hydro technology products. In 2011, the WTO ruled against China's practice of limiting exports of some raw materials, such as rare earth metals that are essential in the production of many important high-tech products, on a complaint from the European Union, Mexico, and the United States.

Particularly troublesome are the very high support prices provided by the European Union (EU) to maintain its farmers' income under its common agricultural policy (CAP). These high farm subsidies lead to huge agricultural surpluses and subsidized exports, which take export markets away from the United States and other countries, and are responsible for some of the sharpest trade controversies between the United States and the European Union (see Case Study 9-4).

■ CASE STUDY 9-4 Agricultural Subsidies in OECD Countries

Table 9.2 gives the financial assistance that Organization for Economic Cooperation and Development (OECD) countries provided to their agriculture, both in billions of U.S. dollars and as a *producer subsidy estimate* (i.e., as a percentage of gross farm receipts) in 2005 and 2010. The table shows that in 2010, the European Union spent the most on agricultural subsidies ($101.4 billion), followed by Japan ($52.9 billion) and the United States ($25.6 billion). The producer subsidy estimate (PSE) in the European Union was more than 2.9 times and that of Japan and 7.1 times that of the United States. Norway, Switzerland, Japan, and Korea provided the highest PSE. Agricultural subsidies were (and continue to be) responsible for some of the sharpest trade controversies in the world today and were responsible for the long delay in concluding the Uruguay Round and the collapse of the Doha Round (see Section 9.7).

One of the sharpest international trade controversies on agricultural subsidies was the cotton case brought by Brazil against the United States in 2002 on $3 billion of subsidies that the latter provided to its cotton farmers. In 2004, the WTO ruled those subsidies to be "inconsistent to WTO commitments" (i.e., to be illegal). Not satisfied with the steps undertaken by the United States to remove subsidies, Brazil announced retaliatory tariffs of $829.3 million on U.S. goods in 2009. But in 2010, Brazil decided to delay their application, with the United States setting up a $147.3 million fund providing technical assistance to Brazil's cotton sector and promising to remove cotton subsidies in its 2012 U.S. farm bill.

(continued)

CASE STUDY 9-4 Continued

TABLE 9.2. Agricultural Subsidies and Producer-Subsidy Equivalents in Various OECD Countries in 2005 and 2010

	Billions of U.S. Dollars		Subsidy as a Percentage of Agricultural Output	
Country	2005	2010	2005	2010
United States	41.0	25.6	15	7
European Union	130.8	101.4	32	20
Japan	44.6	52.9	54	50
Canada	6.5	7.4	22	18
Australia	1.4	1.0	4	2
Norway	3.1	3.6	67	61
Switzerland	5.6	5.4	68	54
Mexico	5.0	6.2	13	12
Korea	23.5	17.5	62	45
Turkey	12.6	22.1	25	28
All Industrial Countries	272.1	227.3	28	18

Sources: Organization for Economic Cooperation and Development, *Agricultural Policies in OECD Countries: Monitoring and Evaluation* (Paris: OECD, 2011), Tables 3.1 and R. Schnepf, *Brazil's WTO Case Against U.S. Cotton Program* (Washington D.C.: Congressional Research Service, June 30, 2010.

Serious controversies also arise from the subsidies that the EU provides to its aircraft (Airbus) industry and Japan's Ministry of International Trade and Industry (MITI) to its computer and other high-tech industries. In 2010, the WTO ruled that both Airbus and Boeing had illegally subsidized their development of new aircrafts over the past decades—but that Airbus was much more guilty and subject to heavier penalties. In 2011, Airbus announced that it had eliminated all illegal subsidies on its planes, but Boeing disputes the claim.

Countervailing duties (CVDs) are often imposed on imports to offset export subsidies by foreign governments. Case Study 9-5 examines the extent of nontariff barriers on the imports of the United States, the European Union, Japan, and Canada.

CASE STUDY 9-5 Pervasiveness of Nontariff Barriers

Table 9.3 gives the pervasiveness of all types of nontariff trade barriers (voluntary export restraints, antidumping measures, technical and other regulations, and countervailing duties) in effect in the United States, the European Union, Japan, and Canada in 1996. The pervasiveness of nontariff trade barriers is measured by the percentage of tariff lines affected. For example, 2.8 percent of the U.S. food, beverage, and tobacco trade was affected by some type of nontariff trade barriers in 1996, as compared with 17.2 percent in the European Union, 5.9 percent in Japan, and 0.4 percent in Canada. From the table, we see that by far the most protected sector in all countries or regions is textiles and apparel. On an overall basis, the trade-weighted percentage of nontariff trade barriers on all manufactured products was 17.9 percent in the United States, 13.4 percent in the European Union, 10.3 percent in Japan, and 7.8 percent in

(continued)

CASE STUDY 9-5 Continued

Canada. These averages are likely to be lower today as a result of the implementation of the provisions of the Uruguay Round, but more recent data are not available. They compare with regular average tariff rates (shown in Case Study 8-1) of 3.3 percent for the United States, 4.0 percent for the European Union, 2.5 percent for Japan, and 4.0 for Canada in 2004. Smaller developed nations made much less use of nontariff trade barriers than large nations, while developing countries made much more use of them.

TABLE 9.3. The Pervasiveness of Nontariff Barriers in Large Developed Nations

	Percent of Tariff Lines Affected			
Product	United States	European Union	Japan	Canada
Food, beverage, and tobacco	2.8	17.2	5.9	0.4
Textiles and apparel	67.5	75.2	31.9	42.9
Wood and wood products	0.6	0.0	0.0	3.2
Paper and paper products	1.1	0.7	0.0	0.4
Chemicals, petroleum products	3.3	2.9	0.9	0.6
Nonmetallic mineral products	3.6	0.0	0.0	0.0
Basic metal industries	30.4	0.6	5.1	1.7
Fabricated metal products	5.9	0.0	0.0	2.2
Other manufacturing	1.7	0.0	0.0	0.9
Average manufacturing	17.9	13.4	10.3	7.8

Sources: World Trade Organization, *Market Access: Unfinished Business* (Geneva: WTO, 2001, p. 21); and WTO, *Annual Report 2011* (Geneva: WTO, 2011).

9.3F Analysis of Export Subsidies

Export subsidies can be analyzed with Figure 9.2, which is similar to Figure 8.1. In Figure 9.2, D_X and S_X represent Nation 2's demand and supply curves of commodity X. If the free trade world price of commodity X were \$3.50 (instead of \$1.00, as in Figure 8.1), Nation 2 would produce 35X ($A'C'$), consume 20X ($A'B'$), and *export* the remaining 15X ($B'C'$). That is, at prices above \$3 (point E in the figure), Nation 2 became an exporter rather than being an importer of commodity X.

If the government of Nation 2 (assumed to be a small country) now provides a subsidy of \$0.50 on each unit of commodity X exported (equal to an ad valorem subsidy of 16.7 percent), P_X rises to \$4.00 for domestic producers and consumers of commodity X. At P_X = \$4, Nation 2 produces 40X ($G'J'$), consumes 10X ($G'H'$), and exports 30X ($H'J'$). The higher price of commodity X benefits producers but harms consumers in Nation 2. Nation 2 also incurs the cost of the subsidy.

Specifically, domestic consumers lose \$7.50 (area $a' + b'$ in the figure), domestic producers gain \$18.75 (area $a' + b' + c'$), and the government subsidy is \$15 ($b' + c' + d'$). Note that area d' is not part of the gain in producer surplus because it represents the rising domestic cost of producing more units of commodity X. Nation 2 also incurs the protection cost or deadweight loss of \$3.75 (the sum of the areas of triangles $B'H'N' = b' = \$2.50$ and $C'J'M' = d' = \$1.25$).

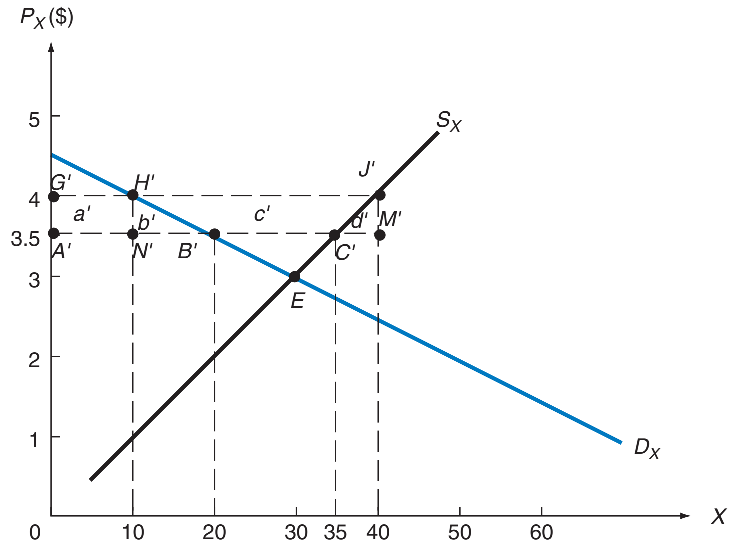

FIGURE 9.2. Partial Equilibrium Effect of an Export Subsidy.
At the free trade price of $P_X = \$3.50$, small Nation 2 produces 35X ($A'C'$), consumes 20X ($A'B'$), and exports 15X ($B'C'$). With a subsidy of \$0.50 on each unit of commodity X exported, P_X rises to \$4.00 for domestic producers and consumers. At $P_X = \$4$, Nation 2 produces 40X ($G'J'$), consumes 10X ($G'H'$), and exports 30X ($H'J'$). Domestic consumers lose \$7.50 (area $a' + b'$), domestic producers gain \$18.75 (area $a' + b' + c'$), and the government subsidy is \$15 ($b' + c' + d'$). The protection cost or deadweight loss of Nation 2 is \$3.75 (the sum of triangles $B'H'N' = b' = \$2.50$ and $C'J'M' = d' = \$1.25$).

Since domestic producers gain less than the sum of the loss of domestic consumers and the cost of the subsidy to Nation 2's taxpayers (i.e., since Nation 2 incurs a net loss equal to the protection cost or deadweight loss of \$3.75), the question is: Why would Nation 2 subsidize exports? The answer is that domestic producers may successfully lobby the government for the subsidy or Nation 2's government may want to promote industry X, if industry X is a desired high-technology industry (this will be discussed in Section 9.5). Note that foreign consumers gain because they receive 30X instead of 15X at $P_X = \$3.50$ with the subsidy. If Nation 2 were not a small nation, it would also face a decline in its terms of trade because of the need to reduce P_X in order to be able to export more of commodity X.

9.4 The Political Economy of Protectionism

In this section, we analyze the various arguments for protection. These range from clearly fallacious propositions to arguments that can stand up, with some qualification, to close economic scrutiny.

9.4A Fallacious and Questionable Arguments for Protection

One *fallacious* argument is that trade restrictions are needed to *protect domestic labor against cheap foreign labor*. This argument is fallacious because even if domestic wages are higher than wages abroad, domestic labor *costs* can still be lower if the productivity of labor is sufficiently higher domestically than abroad. Even if this were not the case, mutually beneficial trade could still be based on comparative advantage, with the cheap-labor nation specializing in the production and exporting of labor-intensive commodities, and the expensive-labor nation specializing in the production and exporting of capital-intensive commodities (refer back to Section 2.4).

Another *fallacious* argument for protection is the scientific tariff. This is the tariff rate that would make the price of imports equal to domestic prices and (so the argument goes) allow domestic producers to meet foreign competition. However, this would eliminate international price differences and trade in all commodities subject to such “scientific” tariffs.

Two *questionable* arguments are that protection is needed (1) to reduce domestic unemployment and (2) to cure a deficit in the nation’s balance of payments (i.e., the excess of the nation’s expenditures abroad over its foreign earnings). Protection would reduce domestic unemployment and a balance-of-payments deficit by leading to the substitution of imports with domestic production. However, these are *beggar-thy-neighbor* arguments for protection because they come at the expense of other nations. Specifically, when protection is used to reduce domestic unemployment and the nation’s balance-of-payments deficit, it causes greater unemployment and worsened balance of payments abroad. As a result, other nations are likely to retaliate, and all nations lose in the end. Domestic unemployment and deficits in the nation’s balance of payments should be corrected with appropriate monetary, fiscal, and trade policies (discussed in Chapters 18 and 19) rather than with trade restrictions.

9.4B The Infant-Industry and Other Qualified Arguments for Protection

One argument for protection that stands up to close economic scrutiny (but must nevertheless be qualified) is the infant-industry argument. It holds that a nation may have a potential comparative advantage in a commodity, but because of lack of know-how and the initial small level of output, the industry will not be set up or, if already started, cannot compete successfully with more established foreign firms. *Temporary* trade protection is then justified to establish and protect the domestic industry during its “infancy” until it can meet foreign competition, achieve economies of scale, and reflect the nation’s long-run comparative advantage. At that time, protection is to be removed. However, for this argument to be valid, the return in the grown-up industry must be sufficiently high also to offset the higher prices paid by domestic consumers of the commodity during the infancy period.

The infant-industry argument for protection is correct but requires several important qualifications which, together, take away most of its significance. First of all, it is clear that such an argument is more justified for developing nations (where capital markets may not function properly) than for industrial nations. Second, it may be difficult to identify which industry or potential industry qualifies for this treatment, and experience has shown that protection, once given, is difficult to remove. Third, and most important, what trade protection (say, in the form of an import tariff) can do, an equivalent production *subsidy* to the infant industry can do better. The reason is that a purely *domestic distortion* such as this should be overcome with a *purely domestic policy* (such as a direct production subsidy to the infant industry) rather than with a trade policy that also distorts relative prices and domestic consumption. A production subsidy is also a more direct form of aid and is easier to remove than an import tariff. One practical difficulty is that a subsidy requires revenues, rather than generating them as, for example, an import tariff does. But the principle remains.

The same general principle also holds for every other type of domestic distortion. For example, if an industry generates an *external economy* (i.e., a benefit to society at large, say, by training workers who then leave to work in other industries), there is likely to be underinvestment in the industry (because the industry does not receive the full benefit from its investments). One way to encourage the industry and confer greater external economies on society would be to restrict imports. This stimulates the industry, but it also increases the price of the product to domestic consumers. A better policy would be to provide a direct subsidy to the industry. This would stimulate the industry without the consumption distortion and loss to consumers that result from trade restrictions. Similarly, a direct tax would also be better than a tariff to discourage activities (such as automobile travel) that give rise to *external diseconomies* (pollution) because the tax does not distort relative prices and consumption. The general principle that the best way to correct a *domestic* distortion is with *domestic* policies rather than with trade policies is shown graphically in Section A9.3 of the appendix.

Trade restrictions may be advocated to protect domestic industries important for national defense. But even in this case, direct production subsidies are generally better than tariff protection. Some tariffs can be regarded as “bargaining tariffs” that are to be used to induce other nations to agree to a mutual reduction in tariffs. Here, political scientists may be more qualified to judge how effective they are in achieving their intended purpose. The closest we come to a truly valid economic argument for protection is the *optimum tariff* discussed in Section 8.6. That is, if a nation is large enough to affect its terms of trade, the nation can exploit its market power and improve its terms of trade and welfare with an optimum tariff. However, other nations are likely to retaliate so that in the end of nations lose. Be that as it may, *Broda, Limao, and Weinstein* (2009) provide evidence that countries set higher tariffs on goods with lower export supply elasticites than on goods with higher supply elasticities.

9.4c Who Gets Protected?

By increasing the commodity price, trade protection benefits producers and harms consumers (and usually the nation as a whole). However, since producers are few and stand to gain a great deal from protection, they have a strong incentive to lobby the government to adopt protectionist measures. On the other hand, since the losses are diffused among many consumers, each of whom loses very little from the protection, they are not likely to effectively organize to resist protectionist measures. Thus, there is a bias in favor of protectionism. An example is provided by the U.S. sugar quota (see Case Study 9-1).

In recent years, economists have developed several theories regarding which groups and industries get protected, and some of these theories have been empirically confirmed. In industrial countries, protection is more likely to be provided to labor-intensive industries employing unskilled, low-wage workers who would have great difficulty in finding alternative employment if they lost their present jobs. Some empirical support has also been found for the *pressure-group* or *interest-group* theory (see Hilmann, 1989; Grosman and Helpman, 1994), which postulates that industries that are highly organized (such as the automobile industry) receive more trade protection than less organized industries. An industry is more likely to be organized if it is composed of only a few firms. Also, industries that produce consumer products generally are able to obtain more protection than industries producing intermediate products used as inputs by other industries because the former industries can exercise *countervailing power* and block protection (since that would increase the price of their inputs).

Furthermore, more protection seems to go to geographically decentralized industries that employ a large number of workers than to industries that operate in only some regions and employ relatively few workers. The large number of workers has strong voting power to elect government officials who support protection for the industry. Decentralization ensures that elected officials from many regions support the trade protection. Another theory suggests that trade policies are biased in favor of maintaining the *status quo*. That is, it is more likely for an industry to be protected now if it was protected in the past. Governments also seem reluctant to adopt trade policies that result in large changes in the distribution of income, regardless of who gains and who loses. Finally, protection seems to be more easily obtained by those industries that compete with products from developing countries because these countries have less economic and political power than industrial countries to successfully resist trade restrictions against their exports.

Some of the above theories are overlapping and some are conflicting, and they have been only partially confirmed empirically. The most highly protected industry in the United States today is the textiles and apparel industry. Case Study 9-6 provides an estimate of the benefit to the world economy from complete trade liberalization.

■ CASE STUDY 9-6 Benefits to the World Economy from Complete Trade Liberalization

Table 9.4 shows the economic benefit of complete trade liberalization on high-income countries, developing countries, and the world as a whole, coming from liberalizing trade in agriculture, textiles, and other manufactured goods; in billions of dollars, as dollars per person, and as percentages of GDPs. All benefits are cumulative to the year 2015. Thus, the first line of the table shows that the total cumulative benefit from complete liberalization in trade in agriculture would be $126 billion for high-income countries and $56 billion for developing countries, for an overall total of $182 billion for the world as a whole by the year 2015. Complete liberalization of trade in textiles and other manufactured goods would provide smaller benefits.

The first column of the table shows that high-income countries would receive a total benefit of $197 billion from the complete liberalization of trade in all sectors (this comes to $194.63 dollars per capita) or 0.60 percent of high-income countries' GDPs, while developing countries would receive a total benefit of $90 billion ($17.59 per person) or 0.80 percent of developing countries' GDPs. For the world as a whole, the total benefit would be $287 billion ($46.84 per capita) or 0.70 percent of world GDP. Thus, half of the total gains would come from agriculture and two-thirds of the total dollar gains would go to high-income countries (but developing countries would gain more as a percentage of their GDPs).

(continued)

■ CASE STUDY 9-6 Continued

■ TABLE 9.4. Benefits to the World Economy from Complete Trade Liberalization

Liberalizing Sector	High-Income Countries	Developing Countries	World
		Total amounts, billions of dollars	
Agriculture	126	56	182
Textiles	14	24	38
Other	57	10	67
Total	197	90	287
		Per capita, dollars per person	
Agriculture	124.48	10.95	29.70
Textiles	13.83	4.69	6.20
Other	56.31	1.95	10.93
Total	194.63	17.59	46.84
		Percentage of GDP	
Agriculture	0.38	0.50	0.44
Textiles	0.04	0.21	0.09
Other	0.17	0.09	0.16
Total	0.60	0.80	0.70

Source: K. Anderson and W. Martin, ed., *Agricultural Reform and the Doha Development Agenda* (Washington, D.C.: World Bank, 2006), Ch. 12.

9.5 Strategic Trade and Industrial Policies

In this section we examine strategic and industrial policies, first in general (Section 9.5A) and then by utilizing game theory (Section 9.5B). In Section 9.5C we discuss the U.S. response to foreign industrial targeting and strategic trade policies.

9.5A Strategic Trade Policy

Strategic trade policy is a relatively recent development advanced in favor of an activist trade policy and protectionism. According to this argument, a nation can create a comparative advantage (through temporary trade protection, subsidies, tax benefits, and cooperative government–industry programs) in such fields as semi-conductors, computers, telecommunications, and other industries that are deemed crucial to future growth in the nation. These high-technology industries are subject to high risks, require large-scale production to achieve economies of scale, and give rise to extensive external economies when successful. Strategic trade policy suggests that by encouraging such industries, the nation can reap the large external economies that result from them and enhance its future growth prospects. This is similar to the infant-industry argument in developing nations, except that it is advanced for industrial nations to acquire a comparative advantage in crucial high-technology industries. Most nations do some of this. Indeed, some economists would go so far as to say that a great deal of the postwar industrial and technological success of Japan was due to its strategic industrial and trade policies.

Examples of strategic trade and industrial policy are found in the steel industry in the 1950s, in semiconductors in the 1970s and 1980s in Japan, in the development of the Concorde (the supersonic aircraft) in the 1970s, and the Airbus from the 1970s in Europe. Semiconductors in Japan are usually given as the textbook case of successful strategic trade and industrial policy. The market for semiconductors (such as computer chips, which are used in many new products) was dominated by the United States in the 1970s. Starting in the mid-1970s, Japan's powerful Ministry of Trade and Industry (MITI) targeted the development of this industry by financing research and development, granting tax advantages for investments in the industry, and fostering government–industry cooperation, while protecting the domestic market from foreign (especially U.S.) competition.

These policies are credited for Japan's success in nearly wresting control of the semiconductor market from the United States in the mid-1980s. Most economists remain skeptical, however, and attribute Japan's stunning performance in this field primarily to other forces, such as greater educational emphasis on science and mathematics, higher rates of investment, and a willingness to take a long-run view of investments rather than stressing quarterly profits, as in the United States. In steel, the other targeted industry in Japan, the rate of return was lower than the average return for all Japanese industries during the postwar period. In Europe, the Concorde was a technological feat but a commercial disaster, and Airbus Industrie would not have survived without continued heavy government subsidies.

While strategic trade policy can theoretically improve the market outcome in oligopolistic markets subject to extensive external economies and increase the nation's growth and welfare, even the originators and popularizers of this theory recognize the serious difficulties in carrying it out. First, it is extremely difficult to pick winners (i.e., choose the industries that will provide large external economies in the future) and devise appropriate policies to successfully nurture them. Second, since most leading nations undertake strategic trade policies at the same time, their efforts are largely neutralized, so that the potential benefits to each may be small. Third, when a country does achieve substantial success with strategic trade policy, this comes at the expense of other countries (i.e., it is a beggar-thy-neighbor policy) and so other countries are likely to retaliate. Faced with all these practical difficulties, even supporters of strategic trade policy grudgingly acknowledge that *free trade is still the best policy, after all*. That is, free trade may be suboptimal in theory, but it is optimal in practice.

9.5B Strategic Trade and Industrial Policies with Game Theory

We can use game theory to examine strategic trade and industrial policy. We can best show this by an example. Suppose that both Boeing and Airbus are deciding whether to produce a new aircraft. Suppose also that because of the huge cost of developing the new aircraft,

TABLE 9.5. Two-Firm Competition and Strategic Trade Policy

		Airbus	
		Produce	Don't Produce
Boeing	Produce	−10,−10	100,0
	Don't produce	0,100	0,0

a single producer would have to have the entire world market for itself to earn a profit, say, of $100 million. If both producers produce the aircraft, each loses $10 million. This information is shown in Table 9.5. The case where both firms produce the aircraft and each incurs a loss of $10 million is shown in the first row and first column (the top left-hand corner) of Table 9.5. If only Boeing produces the aircraft, Boeing makes a profit of $100 million, while Airbus makes a zero profit (the first row and second column, or top right-hand corner of the table). On the other hand, if Boeing does not produce the aircraft while Airbus does, Boeing makes zero profit while Airbus makes a profit of $100 million (the second row and first column, or bottom left-hand corner of the table). Finally, if neither firm produces the aircraft, each makes a zero profit (the second row and the second column, or bottom right-hand corner of the table).

Suppose that for whatever reason Boeing enters the market first and earns a profit of $100 million. Airbus is now locked out of the market because it could not earn a profit. This is the case shown in the first row and second column (the top right-hand corner) of the table. If Airbus entered the market, both firms would incur a loss (and we would have the case shown in the first row and first column, or top left-hand corner of the table). Suppose that now European governments give a subsidy of $15 million per year to Airbus. Then Airbus will produce the aircraft even though Boeing is already producing the aircraft because with the $15 million subsidy Airbus would turn a loss of $10 million into a profit of $5 million. Without a subsidy, however, Boeing will then go from making a profit of $100 million (without Airbus in the market) to incurring a loss of $10 million afterwards. (We are still in the first row and first column, or top left-hand corner of the table, but with the Airbus entry changed from −10 without the subsidy to +5 with the subsidy.) Because of its unsubsidized loss, Boeing will then stop producing the aircraft, thus eventually leaving the entire market to Airbus, which will then make a profit of $100 million without any further subsidy (the second row and first column, or bottom left-hand corner of the table).

The U.S. government could, of course, retaliate with a subsidy of its own to keep Boeing producing the aircraft. Except in cases of national defense, however, the U.S. government has been much less disposed to grant subsidies to firms than are European governments. While the real world is much more complex than this, we can see how a nation could overcome a market disadvantage and acquire a strategic comparative advantage in a high-tech field by using an industrial and strategic trade policy. In fact, in 2000 Airbus decided to build its super-jumbo A380 capable of transporting 550 passengers to be ready by 2006 at a development cost of over $10 billion, and thus compete head-on with the Boeing 747 (which has been in service since 1969 and can carry up to 475 passengers).

Boeing greeted Airbus's decision to build its A380 by announcing in 2001 plans to build the new Boeing 787 Dreamliner jet that can transport, nonstop, and with 20 percent greater fuel efficiency, 250 passengers to any point on earth at close to the speed of sound by 2008. Boeing believes that passengers prefer arriving at their destinations sooner and avoiding congested hubs and the hassle and delays of intermediate stops. Then in 2005, Boeing surprised Airbus by also announcing a new bigger version of its Boeing 747 (the 747-8) to enter service in 2009. Airbus responded by announcing the development of Airbus A350 to compete head-on with the new Boeing 787 with billions of repayable government loans—leading Boeing to file an additional complaint against Airbus at the WTO.

The A380 came into service in 2008 with a delay of more than two years and huge cost overruns, while the first Boeing 787 came off the assembly line in 2011 with a three-year delay and also large cost overruns. As pointed out in Section 9.3E, the WTO ruled in 2010 that both Airbus and Boeing had illegally subsidized their development of new aircrafts over the past decades—but that Airbus was much more guilty and subject to heavier penalties. In 2011, Airbus announced that it had eliminated all illegal subsidies on its planes, but Boeing disputed the claim, and so the dispute goes on.

This type of analysis was first introduced into international trade by *Brander and Spencer* (1985). One serious shortcoming of this analysis is that it is usually very difficult to accurately forecast the outcome of government industrial and trade policies (i.e., get the data to fill a table such as Table 9.5). Even a small change in the table could completely change the results. For example, suppose that if both Airbus and Boeing produce the aircraft, Airbus incurs a loss of $10 million (as before), but Boeing now makes a profit of $10 million (without any subsidy), say, because it is more efficient. Then, even if Airbus produces the aircraft with the subsidy, Boeing will remain in the market because it makes a profit without any subsidy. Then Airbus would require a subsidy indefinitely, year after year, in order to continue to produce the aircraft. In this case, giving a subsidy to Airbus does not seem to be such a good idea. Thus, it is extremely difficult to correctly carry out this type of analysis. We would have to correctly forecast the precise outcome of different strategies, and that is very difficult to do. This is why most economists would say that free trade may still be the best policy after all!

9.5c The U.S. Response to Foreign Industrial Targeting and Strategic Trade Policies

While generally opposed to industrial targeting and strategic trade policy domestically, the United States did respond to and retaliated against countries that adopted these policies to the detriment of U.S. economic interests. The best example of direct federal support for civilian technology was Sematech. This was established in Austin, Texas, in 1987 as a nonprofit consortium of 14 major U.S. semiconductor manufacturers with an annual budget of $225 million ($100 million from the government and the rest from the 14 member firms). Its aim was to help develop state-of-the-art manufacturing techniques for computer chips to help its members better compete with Japanese firms. By 1991, Sematech claimed that as a result of its efforts U.S. computer chip companies had caught up with their Japanese competitors. Since then, Sematech has become entirely private (i.e., it no longer receives U.S. government financial support), and in 1998 it created International Sematech, a wholly owned subsidiary of 12 major computer companies, including some foreign ones (with headquarters in Albany, New York). Currently International Sematech has 18 members.

The United States has also taken unilateral steps to force foreign markets to open more widely to U.S. exports and has retaliated with restrictions of its own against nations that failed to respond. An example was the 1991 semiconductor agreement under which Japan agreed to help U.S. computer chip producers gain a 20 percent share of the Japanese chip market. The agreement was renewed in 1996 but required only that U.S. and Japanese computer chip industries monitor each other's markets without any market-sharing requirement. Since then, U.S. computer chip companies have retaken world leadership in the field, and so the agreement is no longer in operation.

In the early 1990s, the United States also negotiated an agreement with Japan to open the Japanese construction market to bidding by U.S. firms under the threat to close the U.S. market to Japanese construction firms. On a broader scale, the United States and Japan engaged in negotiations (called the Structural Impediments Initiative, or SII) during the mid-1990s aimed, among other things, at opening the entire Japanese distribution system more widely to U.S. firms. Furthermore, the United states requested that other countries, such as Brazil, China, and India, remove excessive restrictions against specific U.S. exports and it demanded protection for its intellectual property (such as patented materials) from unauthorized and uncompensated use.

9.6 History of U.S. Commercial Policy

This section surveys the history of U.S. commercial policy. We start by examining the Trade Agreements Act of 1934 and then discuss the importance of the General Agreement on Tariffs and Trade (GATT). Next we examine the 1962 Trade Expansion Act and the results of the Kennedy Round of trade negotiations. Subsequently, we discuss the Trade Reform Act of 1974 and the outcome of the Tokyo Round of trade negotiations. Finally, we examine the 1984 and the 1988 Trade Acts.

9.6A The Trade Agreements Act of 1934

During the early 1930s, world trade in general and U.S. exports in particular fell sharply because of (1) greatly reduced economic activity throughout the world as a result of the Great Depression and (2) passage in 1930 of the Smoot–Hawley Tariff Act, under which the average import duty in the United States reached the all-time high of 59 percent in 1932, provoking foreign retaliation.

The Smoot–Hawley Tariff Act was originally introduced to aid American agriculture. But through log-rolling in Congress, large tariffs were imposed on manufactured imports as well. The aim was clearly beggar-thy-neighbor to restrict imports and stimulate domestic employment. The bill was passed despite the protest of 36 countries that the tariff would seriously hurt them and that they would retaliate. President Hoover signed the bill into law in spite of a petition signed by more than 1,000 American economists urging him to veto it. The result was catastrophic. By 1932, 60 countries retaliated with stiff tariff increases of their own, in the face of the deepening world depression. The net result was a collapse of world trade (American imports in 1932 were only 31 percent of their 1929 level, and exports fell even more), and this contributed in a significant way to the spreading and deepening of the depression around the world.

To reverse the trend toward sharply reduced world trade, the U.S. Congress under the new Roosevelt administration passed the Trade Agreements Act of 1934. The general principles embodied in this act remained the basis for all subsequent trade legislation in the United States. The act transferred the formulation of trade policy from the more politically minded Congress to the President and authorized the President to negotiate with other nations *mutual* tariff reductions by as much as 50 percent of the rates set under the Smoot–Hawley Tariff Act. The Trade Agreements Act was renewed a total of 11 times before it was replaced in 1962 by the Trade Expansion Act. By 1947, the average U.S. import duty was 50 percent below its 1934 level.

The Trade Agreements Act of 1934 and all subsequent trade legislation were based on the most-favored-nation principle. This nondiscrimination principle extended to all trade partners any *reciprocal* tariff reduction negotiated by the United States with any of its trade partners. The United States would similarly benefit from any bilateral tariff reduction negotiated between any other two nations that were signatories of the most-favored-nation agreement. However, this bilateral trade approach faced the serious shortcoming that tariff reductions were negotiated for the most part only in commodities that *dominated* bilateral trade. Otherwise, many "freeloader" nations, not directly involved in the negotiations and not making any tariff concession (reduction) of their own, would also have benefited from reciprocal tariff reductions negotiated between any other two nations.

9.6B The General Agreement on Tariffs and Trade (GATT)

The General Agreement on Tariffs and Trade (GATT) was an international organization, created in 1947 and headquartered in Geneva (Switzerland), devoted to the promotion of freer trade through multilateral trade negotiations. Originally, it was thought that GATT would become part of the International Trade Organization (ITO), whose charter was negotiated in Havana in 1948 to regulate international trade. When the ITO was not ratified by the U.S. Senate and by the governments of other nations, GATT (which was less ambitious than ITO) was salvaged.

GATT rested on three basic principles:

1. *Nondiscrimination*. This principle refers to the unconditional acceptance of the most-favored-nation principle discussed earlier. The only exceptions to this principle are made in cases of economic integration, such as customs unions (discussed in Chapter 10), and in the trade between a nation and its former colonies and dominions.
2. *Elimination of nontariff trade barriers* (such as quotas), except for agricultural products and for nations in balance-of-payments difficulties.
3. *Consultation among nations in solving trade disputes* within the GATT framework.

By 1993, a total of 123 nations (including the United States and all major countries, with the exception of the countries of the former Soviet Union and China) were signatories of the GATT, and 24 other nations had applied for admission. The agreement covered over 90 percent of world trade.

Under the auspices of GATT, tariffs were reduced by a total of about 35 percent in five different trade negotiations between 1947 and 1962. In 1965 GATT was extended to allow preferential trade treatment to developing nations and to allow them to benefit from tariff reductions negotiated among industrial nations without reciprocity (these are discussed in Chapter 11).

Greater success in tariff reductions was not achieved before 1962 because tariff negotiations were conducted on a *product-by-product* basis and because in the 1950s the U.S. Congress attached serious protectionist devices to the periodic renewals of the Trade Agreements Act. These protectionist devices were:

1. Peril-point provisions, which prevented the president from negotiating any tariff reduction that would cause serious damage to a domestic industry.
2. The escape clause, which allowed any domestic industry that claimed injury from imports to petition the International Trade Commission (the U.S. Tariff Commission until 1975), which could then recommend to the president to revoke any *negotiated*

tariff reduction. A rising share of imports in an industry was sufficient to "prove" injury.

3. The national security clause, which prevented tariff reductions (even if already negotiated) when they would hurt industries important for national defense.

Since meaningful tariff reductions *necessarily* hurt some industries (those in which the nation has a comparative disadvantage), these trade restrictions, especially the escape clause, represented a serious obstacle to greater tariff reductions.

9.6c The 1962 Trade Expansion Act and the Kennedy Round

It was primarily to deal with the new situation created by the formation of the European Union, or Common Market, that the Trade Expansion Act of 1962 was passed by the Congress to replace the Trade Agreements Act.

The Trade Expansion Act of 1962 authorized the president to negotiate across-the-board tariff reductions of up to 50 percent of their 1962 level (and to remove completely duties that were 5 percent or less in 1962). This replaced the product-by-product approach of the Trade Agreements Act. In addition, the 1962 act provided Trade Adjustment Assistance (TAA) to displaced workers and firms injured by tariff reductions. This replaced the no-injury doctrine and took the form of retraining and moving assistance to displaced workers and tax relief, low-cost loans, and technical help to injured firms.

The principle of adjustment assistance was the most significant aspect of the Trade Expansion Act of 1962 since society at large (which was the beneficiary of the trade expansion resulting from tariff reductions) was made to bear, or at least share, the burden of adjustment. However, until the early 1970s, when the criteria for assistance were relaxed, few workers or firms qualified for adjustment assistance. In 1980, the trade assistance program's peak year, more than half a million workers received about $1.6 billion in assistance. Since then, however, the program has shrunk considerably, with only about 30,000 to 40,000 workers receiving a total of $200 million to $400 million in aid each year. The amount of aid provided was greatly expanded to $2 billion per year by the *Trade Adjustment Reform Act of 2002*. In 2010, approximately 140,000 workers received *Trade Adjustment Assistance (TAA)* for a total of $1 billion.

Under the authority of the 1962 Trade Expansion Act, the United States initiated, under GATT auspices, wide-ranging multilateral trade negotiations. These were known as the Kennedy Round. Negotiations in the Kennedy Round were completed in 1967 and resulted in an agreement to cut average tariff rates on industrial products by a total of 35 percent of their 1962 level, to be phased over a five-year period. By the end of 1972, when the agreement was fully implemented, average tariff rates on industrial products were less than 10 percent in industrial nations. However, there were still many serious nontariff trade barriers, especially in agriculture.

9.6d The Trade Reform Act of 1974 and the Tokyo Round

The 1962 Trade Expansion Act was replaced in 1974 by the Trade Reform Act. This authorized the president (1) to negotiate tariff reductions of up to 60 percent and remove tariffs of 5 percent or less and (2) to negotiate reductions in nontariff trade barriers. The act also liberalized the criteria for adjustment assistance.

Under the authority of the Trade Reform Act of 1974, the United States participated in the multilateral tariff negotiations known as the Tokyo Round (actually conducted in Geneva, except for the opening meeting held in Tokyo), which were concluded in 1979. Negotiated tariff reductions phased over an eight-year period, starting in 1980, averaged 31 percent for the United States, 27 percent for the European Union, and 28 percent for Japan. A code of conduct for nations in applying nontariff trade barriers was also prescribed to reduce the restrictive effect of these nontariff barriers. This code included (1) agreement on a government procurement code, (2) uniformity in the application of duties in countervailing and antidumping cases, and (3) a "generalized system of preferences" to the manufactured, semimanufactured, and selected other exports of developing nations. (However, textiles, shoes, consumer electronics, steel, and many other products of great importance to developing nations were excluded.)

The total static gains from trade liberalization under the Tokyo Round amounted to an estimated $1.7 billion annually. With the dynamic gains arising from economies of scale and greater all-around efficiency and innovations, the figure might rise to as high as $8 billion per year. These figures, however, are only rough "guesstimates." Although the United States as a whole benefited from the tariff reductions negotiated under the Tokyo Round, labor (the relatively scarce factor in the United States) and industries with a relatively larger share of small businesses (which are more highly protected in the United States) were somewhat hurt.

9.6E The 1984 and 1988 Trade Acts

The Trade Reform Act of 1974 was followed by the U.S. Trade and Tariff Act of 1984. This law had three major provisions: (1) It authorized the president to negotiate international agreements for the protection of intellectual property rights and to lower barriers to trade in services, high-technology products, and direct investments. (2) It extended the Generalized System of Preferences (GSP), which granted preferential access to the exports of developing countries to the United States (see Section 11.6) until July 1993, but with "graduation" or the removal of preferential access for the exports of the most advanced of the developing countries, such as Korea and Taiwan. (3) It provided authority for negotiations that led to a free trade agreement with Israel. It was under the provisions of this act that the United States called for new multilateral trade negotiations (the Uruguay Round) that started in 1986 (see Section 9.7A).

The Omnibus Trade and Competitiveness Act of 1988 included a Super 301 provision, which (1) calls on the U.S. Special Trade Representative (USTR) to designate priority countries that maintain numerous and pervasive trade barriers, (2) sets a rigorous schedule for negotiations to be held on eliminating those barriers, and (3) requires retaliation by curbing imports from those countries if the negotiations are not successful. In May 1989, the United States named Japan, Brazil, and India as the most unfair traders. Japan was cited for the refusal of its public authorities to purchase U.S. satellites and supercomputers and for excluding U.S.-manufactured forest products. Brazil was cited for licensing requirements it imposes on practically all imports, and India for restrictions on foreign investments and curbs on foreign-based insurance companies. Under the Super 301 provision of the 1988

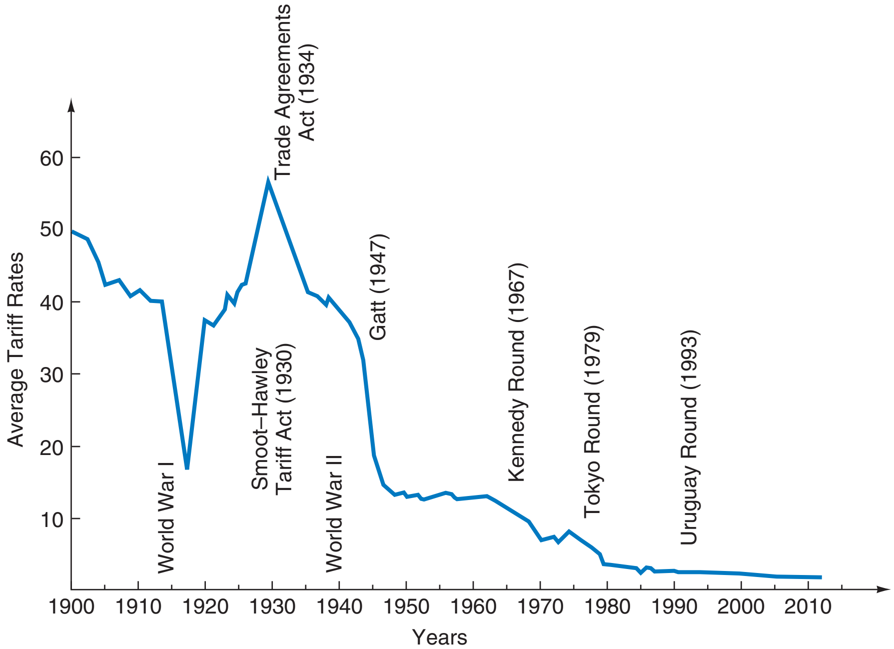

FIGURE 9.3. U.S. Average Tariff Rates on Dutiable Imports, 1900–2012.
Average tariff rates on dutiable imports in the United States ranged from the high of 59 percent, reached in 1932 under the Smoot–Hawley Tariff Act of 1930, to less than 5 percent in 2005. The average tariff rates can fall even without a change in tariff schedules when the proportion of low-tariff imports increases (as after 1972, as a result of the sharp rise in low-tariff petroleum imports).
Sources: Historical Abstract of the United States (Washington, D.C.: U.S. Government Printing Office, 1972); and *Statistical Abstract of the United States* (Washington, D.C.: U.S. Government Printing Office, 2012) for years since 1971.

Trade Act, these nations faced tariffs of 100 percent on selected exports to the United States if they did not relax trade restrictions.

Figure 9.3 summarizes the history of average tariff rates on dutiable imports in the United States from 1900 to 2010. Tariffs in the other leading developed nations have shown similar declines and are now comparable to U.S. rates (see Table 8.1). Note that the average tariff rates shown in the figure fall even without a change in tariff schedules when the proportion of low-tariff imports increases. For example, the fall in the average tariff rates after 1972 was due mostly to the sharp increase in low-tariff imports of petroleum in the United States.

9.7 The Uruguay Round, Outstanding Trade Problems, and the Doha Round

In December 1993, the Uruguay Round of multilateral trade negotiations was completed, but many trade problems remain. In this section, we first review the provisions of the Uruguay Round and then discuss the outstanding trade problems facing the world today, which were supposed to be taken up in the Doha Round.

9.7A The Uruguay Round

In December 1993, the Uruguay Round, the eighth and most ambitious round of multilateral trade negotiations in history, in which 123 countries participated, was completed after seven years of tortuous negotiations. The Round had started in Punta del Este in Uruguay in September 1986 and had been scheduled to be completed by December 1990, but disagreements between the United States and the European Union (EU), especially France, on reducing agricultural subsidies delayed its conclusion for three years. The aim of the Uruguay Round was to establish rules for checking the proliferation of the new protectionism and reverse its trend; bring services, agriculture, and foreign investments into the negotiations; negotiate international rules for the protection of intellectual property rights; and improve the dispute settlement mechanism by ensuring more timely decisions and compliance with GATT rulings. The agreement was signed by the United States and most other countries on April 15, 1994, and took effect on July 1, 1995.

The major provisions of the accord were the following:

1. *Tariffs.* Tariffs on industrial products were to be reduced from an average of 4.7 percent to 3 percent, and the share of goods with zero tariffs was to increase from 20–22 percent to 40–45 percent; tariffs were removed altogether on pharmaceuticals, construction equipment, medical equipment, paper products, and steel.

2. *Quotas.* Nations were to replace quotas on agricultural imports and imports of textiles and apparel (under the Multifiber Agreement) with less restrictive tariffs by the end of 1999 for agricultural products and by the end of 2004 for textiles and apparel; tarrifs on agricultural products were to be reduced by 24 percent in developing nations and by 36 percent in industrial nations, and tariffs on textiles were to be cut by 25 percent.

3. *Antidumping.* The agreement provided for tougher and quicker action to resolve disputes resulting from the use of antidumping laws, but it did not ban their use.

4. *Subsidies.* The volume of subsidized agricultural exports was to be reduced by 21 percent over a six-year period; government subsidies for industrial research were limited to 50 percent of applied research costs.

5. *Safeguards.* Nations could temporarily raise tariffs or other restrictions against an import surge that severely harmed domestic industry, but it barred countries from administering health and safety standards unless based on scientific evidence and not simply to restrict trade. For example, a nation could only keep out beef imports from cattle raised with growth hormones by showing that the beef so produced was unsafe for human consumption.

6. *Intellectual property.* The agreement provided for 20-year protection of patents, trademarks, and copyrights, but it allowed a 10-year phase-in period for patent protection in pharmaceuticals for developing countries.

7. *Services.* The United States failed to secure access to the markets of Japan, Korea, and many developing nations for its banks and security firms, and did not succeed in having France and the European Union lift restrictions on the showing of American films and TV programs in Europe.

8. *Other industry provisions.* The United States and Europe agreed to continue talking about further limiting government subsidies to civil aircraft makers, opening up the distance telephone market, and limiting European subsidies to steelmakers; the United States also indicated that it intended to continue negotiating the further opening of the Japanese computer chip market.

9. *Trade-related investment measures.* The agreement phased out the requirement that foreign investors (such as automakers) buy supplies locally or export as much as they import.

10. *World Trade Organization.* The agreement also called for the replacement of the General Agreement on Tariffs and Trade (GATT) secretariat with the World Trade Organization (WTO) in Geneva with authority not only in trade in industrial products but also in agricultural products and services. Trade disputes were also to be settled by a vote of two-thirds or three-quarters of the nations rather than unanimously as under GATT (which meant that the guilty nation could block any action against it).

Although the completion of the Uruguay Round was in and of itself a great achievement, only some of its aims were met and many trade problems remain (see the next section). It was estimated that the implementation of the Uruguay Round by 2005 increased world welfare by $73 billion, of which $58.3 billion of the gains went to developed countries and $19.2 billion to developing countries (see Case Study 9-7). The collapse of the Uruguay Round, however, would have been disastrous psychologically and could have led to the unrestrained proliferation of trade restrictions and destructive trade wars.

During 1996 and 1997, multilateral agreements to open up trade in telecommunications, financial services, and information technology (that were not reached at the Uruguay Round) were concluded. Over time, these agreements could provide larger gains in trade volumes than the entire Uruguay Round treaty. In 1999, the European Union reached a free trade agreement with Mexico (which became effective in July 2000) to end all tariffs on their bilateral trade. China became the 144th member of the WTO in 2001 and Russia became the 156th member in 2012.

In August 2002, Congress granted the president trade promotion authority, formerly known as "*fast track*," to negotiate broad trade agreements that allowed no amendments, but only an up-or-down vote by Congress to ratify or reject the agreements. The purpose of this legislation was to assure foreign governments that Congress would act expeditiously on any agreement that they negotiate with the U.S. Government. The legislation also required the president to consider environmental protection, labor rights, and antidumping laws in his negotiations, and it provided up to $1.2 billion a year in health insurance and other benefits to workers who lost their jobs, and added farmers and ranchers to the list of those eligible. Fast track, however, was not renewed after it expired in 2007.

Since 2001, the United States has reached free trade agreements (FTAs) with Australia, Bahrain, Chile, Jordan, Morocco, Peru, and Singapore, and signed DRCAFTA (Dominica Republic-Central American Free Trade Agreement, with Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua, and the Dominican Republic). Then, in October 2011, the United States ratified the FTA with South Korea, Colombia, and Panama (in July 2011, the

CASE STUDY 9-7 Gains from the Uruguay Round

Table 9.6 provides an estimate of the welfare gains, in dollars and as a percentage of GPD, as well as the percentage increase in real wages, in various nations and regions of the world resulting from the full implementation of the Uruguay Round by 2005. The table shows that the world welfare rises by $73 billion, of which $53.8 billion or 74 percent goes to the developed countries and the rest to developing countries. European Union (EU) and the European Free Trade Area (EFTA) gain the most ($23.7 billion), followed by the United States (with a gain of $19.8 billion) and Japan (with $6.9 billion). Among developing nations, India gains the most ($2.8 billion), followed by the rest of South Asia ($2.7 billion), Malaysia ($2.6 billion), and South Korea and the Philippines (with $2.5 billion each). China gains $1.3 billion. Only Hong Kong loses a little ($100 million). In terms of percentages of GDP and real wages, the gains of developed nations are less than 0.4 percent, while those of developing countries exceed 2 percent of GDP for the rest of South Asia, Singapore, Malaysia, and the Philippines (except for a gain of 1.92 percent in real wages for Singapore).

TABLE 9.6. Real Income Gains from the Uruguay Round

Country or Region	Welfare Gains (billions of dollars)	Welfare Gains (percent of GDP)	Gains in Real Wages (percent)
Developed Countries:			
United States	19.8	0.22	0.21
Europe Union & EFTA	23.7	0.22	0.21
Japan	6.9	0.11	0.09
Canada	1.6	0.22	0.20
Australia & New Zealand	1.8	0.34	0.36
Developing Countries:			
Asia			
India	2.8	0.68	0.54
Sri Lanka	0.1	0.70	0.54
Rest of South Asia	2.7	2.29	2.43
China	1.3	0.14	0.23
Hong Kong	−0.1	−0.11	0.47
South Korea	2.5	0.45	0.45
Singapore	1.6	2.11	1.92
Indonesia	0.6	0.24	0.32
Malaysia	2.6	2.19	2.56
Philippines	2.5	2.82	3.91
Thailand	0.8	0.40	0.76
Other:			
Mexico	0.1	0.01	0.03
Turkey	0.2	0.11	0.09
Central Europe	1.2	0.33	0.34
Central and South America	0.3	0.02	0.04
Total	73.0		

Source: D. K. Brown, A. V. Deardorff, and R. Stern, ''Computational Analysis of Multilateral Trade Liberalization in the Uruguay Round,'' *Discussion Paper No. 489*, School of Public Affairs, University of Michigan, December 8, 2002.

CASE STUDY 9-8 The Multilateral Rounds of Trade Negotiations

Table 9.7 provides a summary of the year, the place and name of the trade round, the number of participating countries, the subject covered, and the percentage of tariff reduction achieved. From the table we see that the most significant rounds sponsored by the GATT were those of 1947, 1964–1967 (Kennedy Round), 1973–1979 (Tokyo Round), and 1986–1993 (Uruguay Round). The new Doha Round (2001–) sponsored by the WTO is the largest and most difficult one, but it seems unlikely to be successfully concluded.

TABLE 9.7. The GATT Trade Rounds and the WTO Round

Year	Place/Name	Number of Participating Countries	Subject Covered	Percentage Cut in Tariffs
1947	Geneva	23	Tariffs	21
1949	Annecy	13	Tariffs	2
1951	Torquay	38	Tariffs	3
1956	Geneva	26	Tariffs	4
1960–1961	Geneva (Dillon Round)	26	Tariffs	2
1964–1967	Geneva (Kennedy Round)	62	Tariffs and antidumping measures	35
1973–1979	Geneva (Tokyo Round)	99	Tariffs, nontariff measures, multilateral agreements	33
1986–1993	Geneva (Uruguay Round)	125	Tariffs, nontariff measures, agriculture, services, textiles intellectual property, dispute settlement, creation of WTO	34
2001–	Doha (Doha Round)	150	To liberalize global trade in agriculture, industrial goods, and service	To be determined

Source: World Trade Organization, *Annual Report* (Geneva: WTO, 2011).

European Union also signed a free trade agreement with South Korea). Case Study 9-8 provides a summary of the eight rounds of multilateral trade negotiations conducted under the auspices of the GATT since 1947, as well as the new (ninth) Doha Round sponsored by the WTO, which was announced in November 2001 in Doha, the capital of the Gulf state of Qatar, but all but collapsed in July 2006, and all attempts to revive it have so far failed.

9.7B Outstanding Trade Problems and the Doha Round

Despite the great benefits resulting from the successful completion of the Uruguay Round, many serious trade problems remain. *One problem* is continued widespread trade protectionism. As discussed in Sections 9.3 to 9.5, advanced nations often seek to protect domestic production and jobs from foreign competition and use strategic trade and industrial policies to encourage new high-tech industries, and so do emerging market economies. Europe has increased protection on a number of industries out of fear of turning into an industrial wasteland. Russia raised tariffs on used car imports, India banned Chinese toys, and Argentina has tightened licensing requirements on auto parts imports, textiles, and leather goods. The United States and some European countries are subsidizing their embattled automakers and car dealers, their farmers, and their banks—and so the list goes on.

A *second problem* is that subsidies and tariffs on agricultural products remain very high; antidumping measures and safeguards are still possible and frequently abused, and so the potential for serious trade disputes remains. A *third trade problem* is the tendency for the world to break up into three major trading blocs: the European Union (EU), the North America Free Trade Area (NAFTA), and a (much less defined) Asian bloc. (Trading blocs are examined in detail in Chapter 11.) Although these trading blocs could be regarded as building blocks of a freer trading system, they can also become stumbing blocks and lead to more bilateral deals, protectionism, and interbloc trade conflicts.

The *fourth problem* is the call by some developed countries, such as the United States and France, for the establishment of labor and environmental standards. These are supposed to ensure a "leveling of working conditions" between developed and developing countries and avoid "social dumping" by the latter (i.e., developing countries competing unfairly by denying their workers basic rights and decent wages and working conditions). The danger is that the movement to establish labor and environmental standards can easily be captured by protectionistic forces. The same is true for environmental standards (see Section 6.6c). Trade-related competition policies (such as subsidies and regulations) as well as *trade-related investment measures (TRIMs)* also need to be dealt with more adequately than they have been in the Uruguay Round.

An attempt was made to launch a "Millennium Round" of trade negotiations at the WTO Trade Conference held in Seattle in December 1999. The attempt failed because (1) developing countries were adamantly opposed to putting labor and environmental standards on the agenda for the new round; (2) the European Union and Japan objected to the U.S. desire to put on the agenda the complete liberalization of trade in agricultural products; and (3) the United States objected to discussing competition and investment policies that the European Union wanted. All this came up in the face of large demonstrations organized by a strong *antiglobalization movement*, which blamed globalization for many human and environmental problems worldwide and for sacrificing human and environmental well-being to the corporate profits of multinationals (see Section 1.1).

In November 2001, the Doha Round was launched in Doha, Qatar. The agenda included (1) the further liberalization of production and trade in agriculture, industrial products, and services, and (2) the further tightening of rules for antidumping measures and safeguards, as well as investment and competition policies (Case Study 9-9 gives estimates of the welfare benefits to developed and developing countries of a likely Doha scenario). From the very beginning, developing nations were reluctant to make concessions because they felt that the Uruguay Round failed to deliver a great deal of what it promised them and insisted on making the Doha Round a true "development round." The Doha Round was supposed to be concluded by the end of 2004, but after five years of negotiations the Round all but collapsed in July 2006 over disagreements over agricultural subsidies between developed and developing countries and among developed countries themselves. All attempts to revive the Doha Round had failed as of the end of 2012. The WTO has now began to discuss Plan B to reach agreement on those aspects of the Doha negotiations where agreement is possible. In the meantime, there have been renewed efforts to negotiate more bilateral deals.

CASE STUDY 9-9 Benefits from a Likely Doha Scenario

Table 9.8 gives an estimate of benefits (total, per capita, as a percentage of GDP) that developed and developing countries can expect from a "likely" Doha scenario by 2015. The "likely" scenario involves a reduction in agricultural tariffs of between 45 and 75 percent in developed countries and between 35 and 60 percent in developing countries (except for the least-developed countries, which would not be required to make any reductions in agricultural tariffs). For non-agricultural tariffs, the "likely" scenario involves a reduction in tariffs of 50 percent in developed countries and 35 percent in developing countries (and no reductions in the least-developed countries).

Table 9.8 shows that the total projected benefits of a "likely" Doha scenario would be $96 billion (or about one-third of the estimated value of full liberalization) (see Table 9.4 in Case Study 9-6), of which $80 billion would go to developed countries (representing $79.04 per capita and 0.24 percent of their GDP) and $16 billion would go to developing countries (representing $3.13 per capita and 0.14 percent of their GDP).

TABLE 9.8. Benefits from a Likely Doha Scenario

	Developed Countries	Developing Countries	World
Total amounts, billions of dollars	$80	$16	$96
Per capita, dollars per person	$79.04	$3.13	$15.67
Percentage of GDP	0.24%	0.14%	0.23%

Source: K. Anderson and W. Martin, ed., *Agricultural Reform and the Doha Development Agenda* (Washington, D.C.: World Bank, 2006), Ch. 12.

SUMMARY

1. A quota is a direct quantitative restriction on imports or exports. An import quota has the same consumption and production effects as an (equivalent) import tariff. If the government auctions off import licenses to the highest bidder in a competitive market, the revenue effect also is the same. The adjustment to any shift in demand or supply occurs in the domestic price with an import quota and in the quantity of imports with a tariff. If import licenses are not auctioned off, they lead to monopoly profits and possible corruption. An import quota is in general more restrictive than an equivalent import tariff.

2. Voluntary export restraints refer to the case where an importing nation induces another nation to curb its exports of a commodity "voluntarily," under the threat of higher all-around trade restrictions. When successful, their economic impact is the same as that of an equivalent import quota, except for the revenue effect, which is now captured by foreign suppliers. Voluntary export restraints are not likely to be completely successful in limiting imports, however, and they were for the most part phased out by the end of 1999 as a result of the Uruguay Round agreement. There are also numerous other nontariff trade restrictions. These became more important than tariffs as obstructions to the flow of international trade over the past three decades.

3. An international cartel is an organization of suppliers of a commodity located in different nations (or a group of governments) that agrees to restrict output

and exports of the commodity with the aim of maximizing or increasing the total profits of the organization. An international cartel is more likely to succeed if there are only a few international suppliers of an essential commodity for which there is no good substitute. There is also an incentive to stay out of or cheat on the cartel. Trade restrictions can also result from dumping and export subsidies. Dumping is the export of a commodity at below cost or at a lower price than it is sold domestically. Dumping can be persistent, predatory, or sporadic. Countervailing duties (CVDs) are tariffs imposed on imports to offset subsidies by foreign governments.

4. The argument that tariffs are needed to protect domestic labor against cheap foreign labor and the "scientific tariff" is clearly fallacious. Two questionable beggar-thy-neighbor arguments are that protection is needed to reduce domestic unemployment and a deficit in the nation's balance of payments. A more valid argument for protection is the infant-industry argument. However, what trade protection can do, direct subsidies and taxes can do better in overcoming purely domestic distortions. The same is true for industries important for national defense. The closest we come to a valid economic argument for protection is the optimal tariff (which, however, invites retaliation). Trade protection in the United States is usually given to low-wage workers and to large, well-organized industries producing consumer products.

5. Strategic trade and industrial policy is another qualified argument for protection. It suggests that by encouraging high-tech industries, a nation can reap the large external economies that result from them and enhance its future growth prospects. Strategic trade and industrial policy does face, however, many practical difficulties because it is difficult for nations to pick winners and because it invites retaliation. Thus, free trade may still be the best policy after all.

6. The Smoot–Hawley Tariff Act of 1930 resulted in the all-time-high average import duty in the United States of 59 percent in 1932, provoking foreign retaliation. The Trade Agreements Act of 1934 authorized the president to negotiate mutual tariff reductions of up to 50 percent under the most-favored-nation principle. A serious disadvantage was its bilateral approach. The General Agreement on Tariffs and Trade (GATT) was devoted to freer trade based on nondiscrimination, consultation, and removal of nontariff trade barriers, except in agriculture and in nations experiencing balance-of-payments difficulties. Until 1962, tariff reduction was seriously limited by product-by-product negotiations and by U.S. protectionist devices, specifically peril-point provisions, the escape clause, and the national security clause. Under the authority of the 1962 Trade Expansion Act, the United States negotiated tariff reductions averaging 35 percent on industrial products in the Kennedy Round, which was completed in 1967. The 1962 Trade Expansion Act also replaced the no-injury doctrine with adjustment assistance. Under the authority of the Trade Reform Act of 1974, the United States negotiated tariff reductions averaging 31 percent in the Tokyo Round, which was completed in 1979, and accepted a code of conduct for nominal trade barriers. The 1988 Trade Act strengthened U.S. retaliatory procedures against nations that greatly restrict U.S. exports.

7. The Uruguay Round of trade negotiations was completed in December 1993. It called for the reduction of average tariffs on industrial goods from 4.7 percent to 3 percent, for quotas to be replaced by tariffs, and for antidumping and safeguards to be tightened. The agreement also called for reduction in agricultural export subsidies and industrial subsidies, and for protection of intellectual property. During 1996 and 1997, agreements were reached to open up trade in telecommunications, financial services, and information technology. In July 2000, the EU-Mexico free trade agreement became effective; in November 2001, the Doha Round was initiated; China became the 144th member of WTO in 2001 and Russia became the 156th member in 2012; and in August 2002, Congress granted the president trade negotiating authority or fast track. The attempt to launch a new "Millennium Round" failed when nations were unable to reach agreement on the agenda at the trade conference in November 2001. The world is breaking up into a few major trading blocs, a serious antiglobalization movement has come into existence, and there are serious trade disputes among developed countries and between developed and developing nations. These problems were supposed to be resolved in the Doha Round, which all but collapsed in 2006 primarily over disagreements on agricultural subsidies.

A LOOK AHEAD

In Chapter 10, we analyze the economic impact of the formation of regional economic associations (such as the European Union and NAFTA) on the member nations and on the rest of the world. Regional economic associations eliminate tariff and other trade barriers among members but keep them against the outside world. As such, they represent a direct extension of the topics discussed in this chapter. In Chapter 11, we further extend our discussion to analyze the special trade problems of developing nations. Chapter 12 completes Part Two of the text with an examination of international resource movements and multinational corporations.

KEY TERMS

Bilateral trade, p. 279
Centralized cartel, p. 264
Countervailing duties (CVDs), p. 268
Doha Round, p. 287
Dumping, p. 264
Escape clause, p. 279
Export–Import Bank, p. 266
Export subsidies, p. 266
Foreign Sales Corporations (FSC), p. 267
Game theory, p. 275
General Agreement on Tariffs and Trade (GATT), p. 279
Industrial policy, p. 275
Infant-industry argument, p. 271
International cartel, p. 263
International Trade Organization (ITO), p. 279
Kennedy Round, p. 280
Most-favored-nation principle, p. 278
Multilateral trade negotiations, p. 279
National security clause, p. 280
New protectionism, p. 261
Nontariff trade barriers (NTBs), p. 260
Omnibus Trade and Competitiveness Act of 1988, p. 281
Peril-point provisions, p. 279
Persistent dumping, p. 264
Predatory dumping, p. 264
Quota, p. 258
Scientific tariff, p. 271
Smoot–Hawley Tariff Act of 1930, p. 278
Sporadic dumping, p. 264
Strategic trade policy, p. 274
Technical, administrative, and other regulations, p. 262
Tokyo Round, p. 281
Trigger-price mechanism, p. 264
Trade Adjustment Assistance (TAA), p. 280
Trade Agreements Act of 1934, p. 278
Trade and Tariff Act of 1984, p. 281
Trade Expansion Act of 1962, p. 280
Trade promotion authority or fast track, p. 284
Trade Reform Act of 1974, p. 280
Uruguay Round, p. 283
Voluntary export restraints (VERs), p. 261
World Trade Organization (WTO), p. 284

QUESTIONS FOR REVIEW

1. What is an import quota? How is it mostly used today? What are the partial equilibrium effects of an import quota? How are they similar to and different from the effects of an equivalent import tariff?

2. What is meant by voluntary export restraints? How has the United States used them?

3. What are the technical, administrative, and other nontariff barriers to trade? How do they restrict trade? What is the importance of these nontariff trade barriers relative to tariff barriers?

4. What are international cartels? How do their operations restrict trade? Which was the most successful international cartel during the 1970s? Why did its power decline sharply in the 1980s?

5. What is meant by dumping? What are the different types of dumping? Why is dumping undertaken? What conditions are required to make dumping possible? Why does dumping usually lead to trade restrictions?

6. Why do nations subsidize exports? To what problems do these subsidies give rise?

7. What are the fallacious and questionable arguments for protection? Why are they fallacious and questionable?

8. What is the infant-industry argument for protection? How must this argument be qualified?

9. What are the other qualified arguments for protection? In what way must they be qualified?

10. What is meant by strategic and industrial trade policy? What is its relevance?

11. What is the importance of the Trade Agreements Act of 1934? What are the ruling principles of GATT?

12. What are the major accomplishments of the Kennedy Round? of the Tokyo Round? What do the Trade Acts of 1984 and 1988 provide?

13. What did the Uruguay Round accomplish?

14. What are the outstanding trade problems facing the world today?

15. Why do we need the Doha Round?

PROBLEMS

1. Explain why nations impose trade restrictions if free trade is the best policy.

*2. Starting with D_X and S_X and $P_X = \$1$ with free trade in Figure 9.1, analyze the partial equilibrium effects of an import quota of 30X if D_X shifts down to D''_X in such a way that D''_X is parallel to D_X and crosses S_X at $P_X = \$2.50$.

*3. Starting with D_X and S_X and $P_X = \$1$ with free trade in Figure 9.1, analyze the partial equilibrium effects of an import quota of 30X if S_X shifts up to S'_X (parallel to S_X) and crosses D_X at $P_X = \$3.50$.

4. Starting with D_X and S_X and $P_X = \$1$ with free trade in Figure 9.1, analyze the partial equilibrium effects of an import quota of 30X if S_X shifts down to S''_X (parallel to S_X) and crosses D_X at $P_X = \$2.50$.

5. Starting with D_X and S_X and $P_X = \$1$ with free trade in Figure 9.1, analyze the partial equilibrium effects of an import quota of 30X if S_X shifts down to S^*_X (parallel to S_X) and crosses D_X at $P_X = \$2.00$.

6. Starting with D_X and S_X and $P_X = \$4.50$ with free trade in Figure 9.1, analyze the partial equilibrium effects of a negotiated *export* quota of 30X.

7. Explain how the effects of a negotiated export quota of 30X, found in Problem 6, are similar to and different from those of an equivalent import tariff or quota.

8. Draw a straight-line demand curve for a commodity crossing both axes and its corresponding marginal revenue curve (lying everywhere halfway between the vertical axis and the demand curve). On the same graph, draw a hypothetical supply curve for the commodity crossing the demand and marginal revenue curves. If the demand and supply curves refer to the perfectly competitive market for exports of the commodity, determine the equilibrium price and quantity of exports of the commodity.

9. For the same statement in Problem 8, determine the equilibrium price and quantity of exports of the commodity if the supply curve refers to a cartel of exporters acting as a monopolist.

10. Compare your results of Problems 8 and 9. (*Hint*: Review the perfectly competitive and monopoly models in your principles text or notes.)

*11. Draw three sets of price-quantity axes side by side. On the first set of axes (graph), draw a straight-line demand curve (D_1) that is steep, starts at a high price, and refers to the domestic market. On the same set of axes, draw the corresponding marginal

*= Answer provided at www.wiley.com/college/salvatore.

revenue curve (MR_1). On the second graph, draw a straight-line demand curve (D_2) that is low and flat and refers to the international market. On the same (second) set of axes, draw the corresponding MR_2 curve. On the third graph, sum horizontally the MR_1 and MR_2 curves (ΣMR) and draw a marginal cost curve (MC) that intersects the ΣMR curve from below in the third graph; then draw a horizontal dashed line and extend it to the second and first graphs. The point where the horizontal dashed line crosses the MR_1 curve indicates how much the domestic monopolist should sell in the domestic market, and where the horizontal line crosses the MR_2 curve indicates how much he should sell on the international market.

(a) What price should the monopolist charge in the domestic market (P_1) and in the foreign market (P_2)?

(b) Why does this represent the best, or optimal, distribution of sales between the two markets?

12. On a set of axes measuring average costs of production on the vertical axis and the level of output on the horizontal axis, illustrate the infant-industry argument for protection by drawing the long-run average cost curve of an efficient *foreign* firm facing constant returns to scale and the long-run average cost curve of an infant industry in a developing nation that becomes more efficient than established foreign firms as it grows.

13. Indicate the strategic trade policy required (if any) if the entries in the top left-hand corner of Table 9.5 were changed to:

(a) 10, +10;

(b) + 10, 0;

(c) + 5, −10.

14. Suppose that from the free trade production point B, the nation of Figure 8.5 wants to produce 65X (point F). Indicate:

(a) How the nation could do this with a tariff or with a subsidy.

(b) Why the subsidy would be better.

APPENDIX

This appendix analyzes graphically the operation of centralized cartels, international price discrimination, and the use of taxes and subsidies instead of tariffs to correct domestic distortions. It also examines strategic trade and industrial policy more formally with game theory.

A9.1 Centralized Cartels

In Figure 9.4, D_X is the world demand curve for exports of commodity X, and MR_X is the corresponding marginal revenue curve. Note that the MR_X curve lies everywhere halfway between the vertical axis and D_X. S_X is the cartel's supply curve of exports of commodity X. S_X is the horizontal summation of the marginal curves of all cartel members (ΣMC_X). Under perfect competition, international equilibrium is at point E, at which 400X are traded at $P_X = \$3$.

An international cartel of exporters of commodity X acting as a monopolist (or *centralized cartel*) would maximize total profits by restricting exports to 300X (given by the intersection of the S_X or ΣMC_X curve with the MR_X curve at point F) and charging $P_X = \$3.50$ (given by point G on D_X). The increase in the total profits of the exporters of commodity X as a group (i.e., of the cartel) is given by the shaded area in the figure. The reason for this increase is that by restricting the total exports of commodity X to 300X, the international cartel eliminated all the exports for which MC_X exceeded MR_X, so that total profits are higher by the sum of those differences.

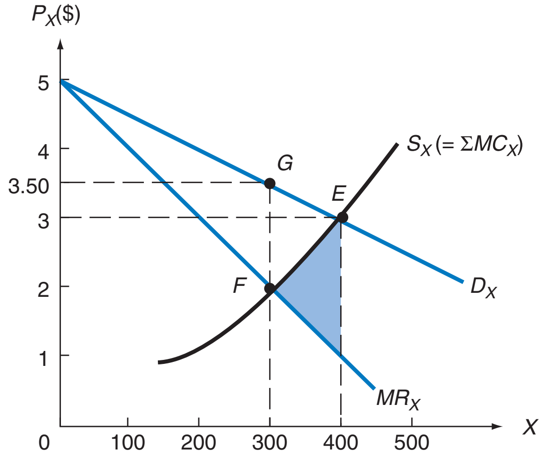

FIGURE 9.4. **Maximization of the International Cartel's Total Profits.**
D_X is the total demand for exports of commodity X, and S_X is the total supply of exports. Under perfect competition, equilibrium is at point E, at which 400X are traded at $P_X = \$3$. An international cartel of all exporters of commodity X that acts as a monopolist would maximize total profits by restricting exports to 300X (given by the intersection of the MR_X and the S_X or ΣMC_X curves at point F) and charging $P_X = \$3.50$ (given by point G on D_X). The total profits of the cartel are higher by the size of the shaded area in the figure.

Problem Starting with D_X and S_X in Figure 9.4, draw a figure showing the monopoly result if there are only two identical exporters of commodity X and they agree to share the market equally. This is a market-sharing cartel.

A9.2 International Price Discrimination

Persistent dumping, or international price discrimination, is illustrated in Figure 9.5. In the figure, the horizontal summation of the marginal revenue curve in the domestic market (MR_d) and the marginal revenue curve in the foreign market (MR_f) give ΣMR. Point E, where the MC curve intersects the ΣMR curve from below, indicates that the domestic monopolist should sell a *total* of 300X in order to maximize his or her total profits. The distribution of the sale of these 300X between the foreign and the domestic market is given by the point where a horizontal line from point E crosses MR_f and MR_d, respectively. Thus, the domestic monopolist should sell 200X in the foreign market at $P_X = \$3$, and 100X in the domestic market at $P_X = \$4$. P_X is higher in the domestic market (which is insulated by transportation costs and trade barriers) than in foreign markets (where the domestic monopolist faces foreign competition).

The general principle to maximize total profits is that $MR_d = MR_f$. If $MR_d \neq MR_f$, total profits could be increased by transferring sales from the market with the lower MR to the market with the higher MR until MR was the same in the two markets. $P_{f} < P_d$ because D_f is more elastic than D_d in the relevant range. D_f is more elastic than D_d because of the availability of close substitutes on the international market.

Problem If the absolute value of the price elasticity of demand in the domestic market (e_d) is 2 and e_f in the foreign market is 3, and $\Sigma MR = MC = \$10$, calculate at what price the

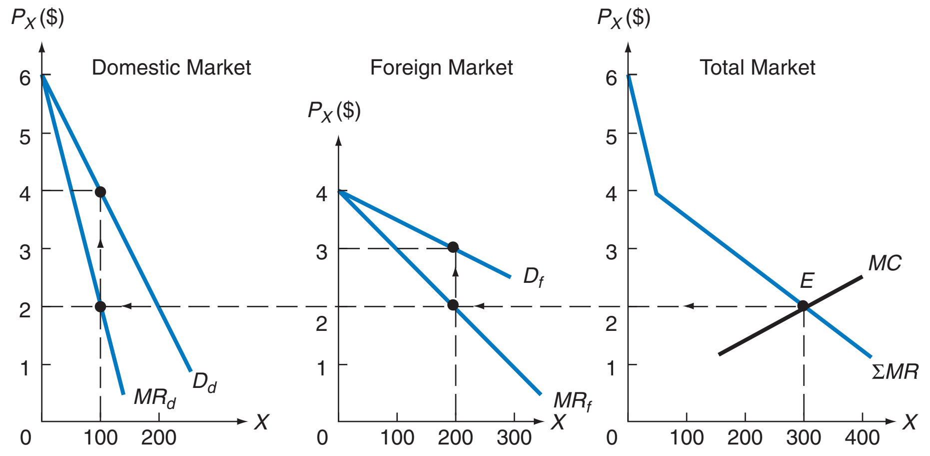

FIGURE 9.5. International Price Discrimination.
The total output that maximizes total profits is 300X and is given by point E, where the $\Sigma MR (= MR_d + MR_f)$ curve crosses the MC curve. Of these 300X, 200X should be sold in the foreign market (given by the point where a horizontal line from point E crosses MR_f) at $P_X = \$3$, and 100X should be sold in the domestic market (given by the point where a horizontal line from point E crosses MR_d) at $P_X = \$4$. The principle to maximize total profits is that $MR_d = MR_f$.

domestic monopolist practicing international price discrimination should sell in the domestic market (P_d) and in the foreign market (P_f) in order to maximize total profits. [*Hint*: Use the formula $MR = P(1 - 1/e)$ from microeconomic theory.]

A9.3 Tariffs, Subsidies, and Domestic Goals

In this section, we show graphically that a subsidy is better than a tariff to achieve a purely *domestic* goal. Figure 9.6 (an extension of Figure 8.5) shows that with free trade the nation produces at point B (40X and 120Y) and consumes at point E (100X and 60Y) on indifference curve III at $P_X/P_Y = P_W = 1$. If now the nation wants to produce 65X (point F in the figure), it can do so either by imposing a 100 percent import tariff on commodity X or giving a 100 percent subsidy to domestic producers of commodity X. By imposing a 100 percent tariff on the imports of commodity X (so that $P_X/P_Y = P_F = 2$), the nation will produce at point F (65X, as required, and 85Y) and consume at point H' on indifference curve II′ (if the government redistributes the tariff revenue as a *general* subsidy to consumers). So far this is the same as in Figure 8.5.

With a 100 percent subsidy to domestic producers of commodity X, the price consumers pay remains $P_X/P_Y = 1$ (as under free trade) and the nation will reach indifference curve II″ (which is higher than indifference curve II′). Thus, a subsidy is better than a tariff that gives the same amount of protection to domestic producers because the subsidy, as opposed to a tariff, does not distort the prices that consumers pay.

Problem Indicate how the nation of Figure 9.6 can reach production point B if external diseconomies in the production of X make the nation produce at point F at the free trade price of $P_X/P_Y = P_W = 1$.

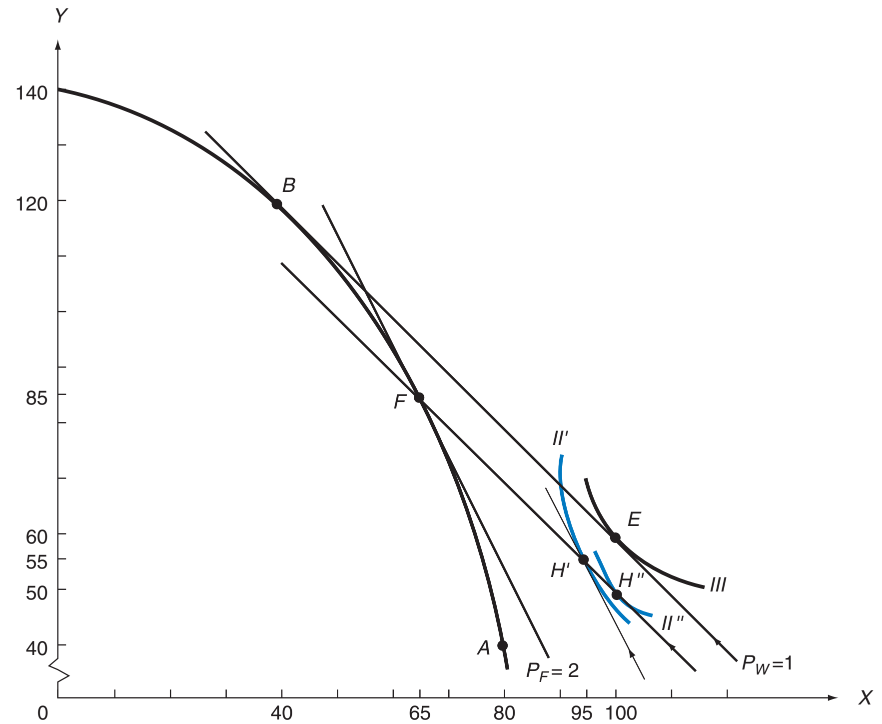

FIGURE 9.6. A Tariff vs. a Subsidy to Achieve a Domestic Goal.
With free trade the nation produces at point *B* (40X and 120Y) and consumes at point *E* with $P_X/P_Y = P_W = 1$. With a 100 percent import tariff on commodity X, $P_X/P_Y = P_F = 2$ and the nation produces 65X (point *F*) and consumes at point H′ on indifference curve II′ (as in Figure 8.5). With a 100 percent subsidy on domestic producers of X, the price consumers pay remains $P_X/P_Y = 1$ (as under free trade) and the nation reaches indifference curve II′′ (which is higher than II′).

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http://www.gpoaccess.gov/eop

http://www.state.gov

http://www.ustr.gov

http://www.usitc.gov

For international trade policies around the world, see the Internet site of the World Trade Organization (WTO), the European Union, and the Canadian Department of Foreign Affairs, respectively, at:

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For a discussion of "fast track," see:

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http://www.citt.gc.ca

For information on the Export–Import Bank, see:

http://www.exim.gov

For government support of R&D in the United States, Japan, and Korea, see the web site of the National Science Foundation and Sematech for the United States, the Statistics Center of the Management and Coordination Agency for Japan, and the World Bank site for Korea, respectively, at:

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Economic Integration: Customs Unions and Free Trade Areas

chapter 10

LEARNING GOALS:

After reading this chapter, you should be able to:

- Understand the meaning of trade creation, trade diversion, and the dynamic benefits of economic integration
- Describe the importance and effects of the European Union (EU) and NAFTA
- Describe attempts at economic integration among developing countries and countries in Central and Eastern Europe

10.1 Introduction

In this chapter, we examine economic integration in general and customs unions in particular. The theory of economic integration refers to the commercial policy of discriminatively reducing or eliminating trade barriers only among the nations joining together. The degree of economic integration ranges from preferential trade arrangements to free trade areas, customs unions, common markets, and economic unions.

Preferential trade arrangements provide lower barriers on trade among participating nations than on trade with nonmember nations. This is the loosest form of economic integration. The best example of a preferential trade arrangement is the *British Commonwealth Preference Scheme*, established in 1932 by the United Kingdom with members and some former members of the British Empire.

A free trade area is the form of economic integration wherein all barriers are removed on trade among members, but each nation retains its own barriers to trade with nonmembers. The best examples are the *European Free Trade Association (EFTA)*, formed in 1960 by the United Kingdom, Austria, Denmark, Norway, Portugal, Sweden, and Switzerland; the *North American Free Trade Agreement (NAFTA)*, formed by the United States, Canada, and Mexico in 1993; and the

Southern Common Market (Mercosur) formed by Argentina, Brazil, Paraguay, and Uruguay in 1991.

A customs union allows no tariffs or other barriers on trade among members (as in a free trade area), and in addition it harmonizes trade policies (such as the setting of common tariff rates) toward the rest of the world. The most famous example is the European Union (EU), or *European Common Market*, formed in 1957 by West Germany, France, Italy, Belgium, the Netherlands, and Luxembourg. Another example is the *Zollverein*, or customs union, established in 1834 by a large number of sovereign German states, which proved significant in Bismarck's unification of Germany in 1870.

A common market goes beyond a customs union by also allowing the free movement of labor and capital among member nations. The EU achieved the status of a common market at the beginning of 1993.

An economic union goes still further by harmonizing or even unifying the monetary and fiscal policies of member states. This is the most advanced type of economic integration. An example is *Benelux*, which is the economic union of Belgium, the Netherlands, and Luxembourg, formed after World War II (and now part of the EU). An example of a *complete* economic and monetary union is our own United States.

An interesting recent development that can be analyzed with the same concepts used to analyze customs unions is duty-free zones or free economic zones. These are areas set up to attract foreign investments by allowing raw materials and intermediate products duty-free.

The discussion in this chapter is generally in terms of customs unions, but most of what is said refers also to other forms of regional economic association. In Section 10.2, we examine a trade-creating customs union. In Section 10.3, we analyze a trade-diverting customs union. Section 10.4 presents the theory of the second best. Section 10.5 examines the dynamic effects of customs unions, and Section 10.6 gives a brief history of various attempts at economic integration. The appendix presents the general equilibrium analysis of the static effects of a trade-diverting customs union and provides information on the regional trade agreements (RTAs) in operation today.

10.2 Trade-Creating Customs Union

In this section, we first explain the process of trade creation, and then we illustrate the effects of a trade-creating customs union.

10.2A Trade Creation

The static, *partial equilibrium* effects of forming a customs union are measured in terms of trade creation and trade diversion. Trade creation occurs when some domestic production in a nation that is a member of the customs union is replaced by lower-cost imports from another *member nation*. Assuming that all economic resources are fully employed before and after formation of the customs union, this increases the welfare of member nations because it leads to greater specialization in production based on comparative advantage. A trade-creating customs union also increases the welfare of nonmembers because some of the increase in its real income (due to its greater specialization in production) spills over into increased imports from the rest of the world.

10.2B Illustration of a Trade-Creating Customs Union

The effects of a trade-creating customs union are illustrated in Figure 10.1, which is adapted from Figure 8.3. D_X and S_X in Figure 10.1 are Nation 2's domestic demand and supply curves of commodity X. Suppose that the free trade price of commodity X is $P_X = \$1$ in Nation 1 and $P_X = \$1.50$ in Nation 3 (or the rest of the world), and Nation 2 is assumed to be too small to affect these prices. If Nation 2 initially imposes a nondiscriminatory ad valorem tariff of 100 percent on all imports of commodity X, then Nation 2 will import commodity X from Nation 1 at $P_X = \$2$. At $P_X = \$2$, Nation 2 consumes 50X *(GH)*, with 20X *(GJ)* produced domestically and 30X *(JH)* imported from Nation 1. Nation 2 also collects \$30 *(MJHN)* in tariff revenues. In the figure, S_1 is Nation 1's perfectly elastic supply curve of commodity X to Nation 2 under free trade, and $S_1 + T$ is the tariff-inclusive supply curve. Nation 2 does not import commodity X from Nation 3 because the tariff-inclusive price of commodity X imported from Nation 3 would be $P_X = \$3$.

If Nation 2 now forms a customs union with Nation 1 (i.e., removes tariffs on its imports from Nation 1 only), $P_X = \$1$ in Nation 2. At this price, Nation 2 consumes 70X *(AB)* of commodity X, with 10X *(AC)* produced domestically and 60X *(CB)* imported from Nation 1. In this case, Nation 2 collects no tariff revenue. The benefit to consumers in Nation 2 resulting from the formation of the customs union is equal to *AGHB* (the increase in the consumer surplus defined in Section 8.2B). However, only part of this represents a net gain for Nation 2 as a whole. That is, *AGJC* represents a reduction in rent, or producer surplus, while *MJHN* represents the loss of tariff revenues. This leaves the sum of the area of shaded triangles *CJM* and *BHN*, or \$15, as the net static welfare gain for Nation 2.

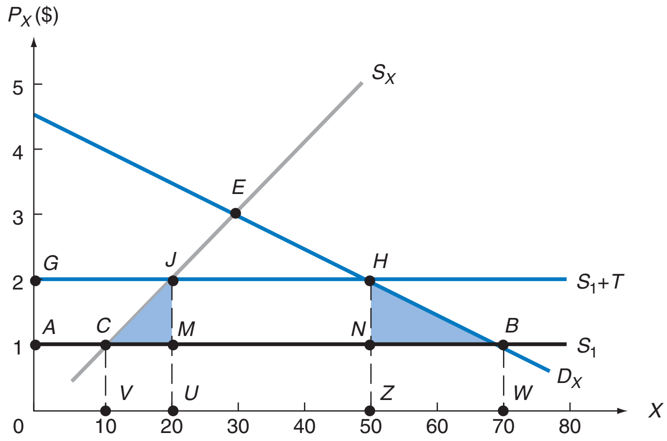

FIGURE 10.1. A Trade-Creating Customs Union.
D_X and S_X represent Nation 2's domestic demand and supply curves of commodity X. At the tariff-inclusive $P_X = \$2$ before the formation of the customs union, Nation 2 consumes 50X *(GH)*, with 20X *(GJ)* produced in Nation 2 and 30X *(JH)* imported from Nation 1. Nation 2 also collects a tariff revenue of \$30 *(MJHN)*. Nation 2 does not import commodity X from Nation 3 because of the tariff-inclusive $P_X > \$2$. After Nation 2 forms a customs union with Nation 1 only, Nation 2 consumes 70X *(AB)*, with 10X *(AC)* produced domestically and 60X *(CB)* imported from Nation 1 at $P_X = \$1$. The tariff revenue disappears, and area *AGJC* represents a transfer from domestic producers to domestic consumers. This leaves net static gains to Nation 2 as a whole equal to \$15, given by the sum of the areas of shaded triangles *CJM* and *BHN*.

Triangle *CJM* is the production component of the welfare gain from trade creation and results from shifting the production of 10X *(CM)* from less efficient domestic producers in Nation 2 (at a cost of *VUJC*) to more efficient producers in Nation 1 (at a cost of *VUMC)*. Triangle *BHN* is the consumption component of the welfare gain from trade creation and results from the increase in consumption of 20X *(NB)* in Nation 2, giving a benefit of *ZWBH* with an expenditure of only *ZWBN*.

Viner, who pioneered the development of the theory of customs unions in 1950, concentrated on the production effect of trade creation and ignored the consumption effect. *Meade* extended the theory of customs unions in 1955 and was the first to consider the consumption effect. *Johnson* then added the two triangles to obtain the total welfare gain of a customs union. (See the Selected Bibliography for the complete references.)

10.3 Trade-Diverting Customs Unions

In this section, we first explain the meaning of trade diversion, and then we illustrate the effects of a trade-diverting customs union.

10.3A Trade Diversion

Trade diversion occurs when lower-cost imports from outside the customs union are replaced by higher cost imports from a union member. This results because of the preferential trade treatment given to member nations. Trade diversion, by itself, reduces welfare because it shifts production from more efficient producers outside the customs union to less efficient producers inside the union. Thus, trade diversion worsens the international allocation of resources and shifts production away from comparative advantage.

A trade-diverting customs union results in *both* trade creation and trade diversion, and therefore can increase or reduce the welfare of union members, depending on the relative strength of these two opposing forces. The welfare of nonmembers can be expected to decline because their economic resources can only be utilized less efficiently than before trade was diverted away from them. Thus, while a trade-creating customs union leads only to trade creation and unequivocably increases the welfare of members and nonmembers, a trade-diverting customs union leads to both trade creation and trade diversion, and can increase or reduce the welfare of members (and will reduce the welfare of the rest of the world).

10.3B Illustration of a Trade-Diverting Customs Union

The effects of a trade-diverting customs union are illustrated in Figure 10.2. In this figure, D_X and S_X are Nation 2's domestic demand and supply curves of commodity X, while S_1 and S_3 are the free trade perfectly elastic supply curves of Nation 1 and Nation 3, respectively. With a nondiscriminatory 100 percent tariff on imports of commodity X, Nation 2 imports commodity X from Nation 1 at $P_X = \$2$, along $S_1 + T$ (exactly as in Figure 10.1). As seen earlier, at $P_X = \$2$, Nation 2 consumes 50X *(GH)*, with 20X *(GJ)* produced domestically and 30X *(JH)* imported from Nation 1. Nation 2 also collects \$30 *(JMNH)* in tariff revenues.

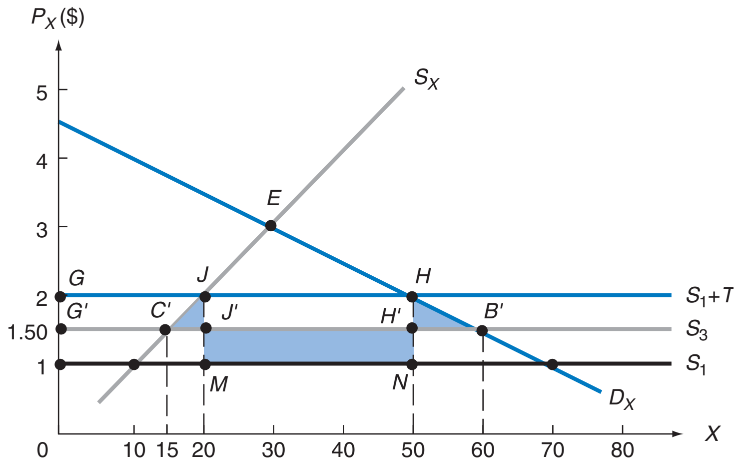

FIGURE 10.2. A Trade-Diverting Customs Union.
D_X and S_X represent Nation 2's domestic demand and supply curves of commodity X, while S_1 and S_3 are the free trade perfectly elastic supply curves of commodity X of Nation 1 and Nation 3, respectively. With a nondiscriminatory 100 percent tariff, Nation 2 imports 30X *(JH)* at $P_X = \$2$ from Nation 1. After forming a customs union with Nation 3 only, Nation 2 imports 45X *(C′B′)* at $P_X = \$1.50$ from Nation 3. The welfare gain in Nation 2 from pure trade creation is $3.75 (given by the sum of the areas of the two shaded triangles). The welfare loss from trade diversion proper is $15 (the area of the shaded rectangle). Thus, this trade-diverting customs union leads to a net welfare loss of $11.25 for Nation 2.

If Nation 2 now forms a customs union with Nation 3 only (i.e., removes tariffs on imports from Nation 3 only), Nation 2 finds it cheaper to import commodity X from Nation 3 at $P_X = \$1.50$. At $P_X = \$1.50$, Nation 2 consumes 60X *(G′B′)*, with 15X *(G′C′)* produced domestically and 45X *(C′B′)* imported from Nation 3. In this case, Nation 2 collects no tariff revenue. The imports of commodity X into Nation 2 have now been *diverted* from the more efficient producers in Nation 1 to the less efficient producers in Nation 3 because the tariff discriminates against imports from Nation 1 (which is outside the union). Note that Nation 2's imports of commodity X were 30X before formation of the customs union and 45X afterward. Thus, the trade-diverting customs union also leads to some trade creation.

The static welfare effects on Nation 2 resulting from the formation of a customs union with Nation 3 can be measured from the shaded areas shown in Figure 10.2. The sum of the areas of shaded triangles $C'JJ'$ and $B'HH'$ ($3.75) is the welfare gain resulting from pure trade creation, while the area of shaded rectangle $MNH'J'$ ($15) is the welfare loss from diverting the initial 30X *(JH)* of imports from lower cost Nation 1 to higher cost Nation 3. Specifically, of the gain in consumer surplus of $G'GHB'$ resulting from the formation of the customs union, $G'GJC'$ represents a transfer from producer to consumer surplus in Nation 2 and therefore washes out (i.e., leaves no net gain or loss for Nation 2 as a whole). Of the $JMNH$ ($30) tariff revenue collected by Nation 2 before the formation of the customs union with Nation 3, $J'JHH'$ is transferred to consumers in Nation 2 in the form of the lower price of commodity X after the formation of the customs union. This leaves only shaded triangles $C'JJ'$ and $B'HH'$ as the net gain to Nation 2 and shaded rectangle $MNH'J'$ as the still unaccounted for loss of tariff revenue.

Since the area of the shaded rectangle ($15) measuring the welfare loss from trade diversion proper exceeds the sum of the areas of the shaded triangles ($3.75) measuring the welfare gain from pure trade creation, this trade-diverting customs union leads to a net welfare loss of $11.25 for Nation 2. This need not always be the case, however. Looking at Figure 10.2, we can see that the flatter (i.e., the more elastic in the relevant range) D_X and S_X are and the closer S_3 is to S_1, the greater is the sum of the areas of the shaded triangles and the smaller the area of the shaded rectangle. This makes it more likely that even a trade-diverting customs union will lead to a net welfare gain for the nation joining the union. (The figure showing this is left as an end-of-chapter problem.) The static welfare effects of a trade-diverting customs union are examined within the more advanced general equilibrium framework in the appendix to this chapter.

The several attempts to measure (along the lines discussed above) the static welfare effects resulting from the formation of the European Union all came up with surprisingly small *net static* welfare gains (in the range of 1 to 2 percent of GDP).

10.4 The Theory of the Second Best and Other Static Welfare Effects of Customs Unions

We now examine the general principle known as the theory of the second best, of which the theory of customs unions is a special case. We then go on to examine the conditions under which a customs union is more likely to lead to trade creation and increased welfare, and finally we examine some other static welfare effects of customs unions.

10.4A The Theory of the Second Best

We saw in Part One that free trade leads to the most efficient utilization of world resources and thus maximizes world output and welfare. Therefore, prior to *Viner's* work on customs unions in 1950, it was widely believed that any movement toward freer trade would also increase welfare. To the extent that a customs union does not increase trade barriers against the rest of the world, the elimination of trade barriers among union members represents a movement toward freer trade. As such, it was believed to increase the welfare of member and nonmember nations alike.

However, *Viner* showed that the formation of a customs union could increase or reduce the welfare of member nations and of the rest of the world, depending on the circumstances under which it takes place. This is an example of the theory of the second best, which states that if all the conditions required to maximize welfare or reach Pareto optimum cannot be satisfied, trying to satisfy as many of these conditions as possible does not necessarily or usually lead to the second-best position. Thus, forming a customs union and removing trade barriers only among the members will not necessarily produce the second-best welfare position (as evidenced by the fact that welfare can rise or fall). This somewhat startling conclusion has great significance not only for the field of international economics (from which it originated) but for the study of economics in general. The theory of customs unions is just one example from international trade of this general principle. From its somewhat vague beginning in the work of *Viner*, the theory of the second best was then fully developed by *Meade* in 1955 and generalized by *Lipsey and Lancaster* in 1956.

10.4B Conditions More Likely to Lead to Increased Welfare

A customs union is more likely to lead to trade creation and increased welfare under the following conditions:

1. The higher are the preunion trade barriers of member countries. There is then a greater probability that formation of the customs union will create trade among union members rather than divert trade from nonmembers to members.
2. The lower are the customs union's barriers on trade with the rest of the world. This makes it less likely that formation of the customs union will lead to costly trade diversion.
3. The greater is the number of countries forming the customs union and the larger their size. Under these circumstances, there is a greater probability that low-cost producers fall within the union.
4. The more competitive rather than complementary are the economies of member nations. There are then greater opportunities for specialization in production and trade creation with the formation of the customs union. Thus, a customs union is more likely to increase welfare if formed by two competitive industrial nations rather than by an industrial nation and an agricultural (complementary) nation.
5. The closer geographically are the members of the customs union. Then transportation costs represent less of an obstacle to trade creation among members.
6. The greater is the preunion trade and economic relationship among potential members of the customs union. This leads to greater opportunities for significant welfare gains as a result of the formation of the customs union.

The European Union (EU) has had greater success than the European Free Trade Association (EPTA) because the nations forming the EU were much more competitive than complementary, were closer geographically, and had greater preunion trade than the EFTA nations (reasons 4, 5, and 6 above).

10.4C Other Static Welfare Effects of Customs Unions

There are other *static* welfare effects resulting from the formation of a customs union. One is the administration savings from the elimination of customs officers, border patrols, and so on, for trade among member nations. This benefit arises whether the customs union is trade creating or trade diverting.

Second, a trade-diverting customs union, by reducing its demand for imports from and its supply of exports to the rest of the world, is likely to lead to an improvement in the *collective* terms of trade of the customs union. This can be shown graphically by an inward shift in the customs union's offer curve. However, for a trade-creating customs union, the opposite is likely to be true, since part of the increase in real income resulting from formation of the customs union spills over into a greater demand for imports from the rest of the world. Whether an *individual* member's terms of trade improve, deteriorate, or remain unchanged depends on the circumstances.

Finally, any customs union, by acting as a single unit in international trade negotiations, is likely to have much more bargaining power than all of its members separately. There is no doubt, for example, that this is the case for the EU.

10.5 Dynamic Benefits from Customs Unions

Besides the static welfare effects discussed earlier, the nations forming a customs union are likely to receive several important *dynamic* benefits. These are due to increased competition, economies of scale, stimulus to investment, and better utilization of economic resources. These will be examined in turn.

The greatest dynamic benefit from the formation of a customs union is the *increased competition* that is likely to result. That is, in the absence of a customs union, producers (especially those in monopolistic and oligopolistic markets) are likely to grow sluggish and complacent behind trade barriers. But when a customs union is formed and trade barriers among member nations are eliminated, producers in each nation must become more efficient to meet the competition of other producers within the union, merge, or go out of business. The increased level of competition is also likely to stimulate the development and utilization of new technology. All of these efforts will cut costs of production to the benefit of consumers. A customs union must, of course, be careful (by passing and enforcing antitrust legislation) that such oligopolistic practices as collusion and market-sharing agreements, which earlier might have restricted competition nationally, are not replaced by similar union-wide practices after the formation of the customs union. The EU has attempted to do just that.

A second possible benefit from the formation of a customs union is that *economies of scale* are likely to result from the enlarged market. However, it must be pointed out that even a small nation that is not a member of any customs union can overcome the smallness of its domestic market and achieve substantial economies of scale in production by exporting to the rest of the world. For example, it was found that plants in many major industries in such relatively small nations as Belgium and the Netherlands were already of comparable size to U.S. plants before they joined the EU and thus already enjoyed substantial economies of scale by producing for the domestic market and for export. Nevertheless, significant economies were achieved after the formation of the EU by reducing the range of differentiated products manufactured in each plant and increasing "production runs" (see Section 6.4A).

Another possible benefit is the *stimulus to investment* to take advantage of the enlarged market and to meet the increased competition. Furthermore, the formation of a customs union is likely to spur outsiders to set up production facilities within the customs union to avoid the (discriminatory) trade barriers imposed on nonunion products. These are the so-called tariff factories. The massive investments that U.S. firms made in Europe after 1955 and again after 1986 can be explained by their desire not to be excluded from this rapidly growing market.

Finally, in a customs union that is also a common market, the free community-wide movement of labor and capital is likely to result in better utilization of the economic resources of the entire community.

These dynamic gains resulting from the formation of a customs union are presumed to be much greater than the static gains discussed earlier and to be very significant. Indeed, the United Kingdom joined the EU in 1973 primarily because of them. Recent empirical studies seem to indicate that these dynamic gains are about five to six times larger than the static gains. The monetary aspects of the formation of a customs union are discussed under the heading of "optimum currency areas" in Section 20.4.

To be pointed out, however, is that joining a customs union because of the static and dynamic benefits that it provides is only a second-best solution. The best policy may be for a nation to *unilaterally* eliminate all trade barriers. For a nation such as the United States that is large enough to affect its terms of trade, however, the efficiency benefits resulting from unilaterally eliminating its trade barriers must be weighed against the worsening of its terms of trade. The unilateral elimination of all trade barriers would also be difficult politically because of strong opposition from the very vocal and influential minorities that would be hurt in the process. A related question is whether regional blocs are building blocks or stumbling blocks to free multilateral trade. There is a great deal of disagreement here. Some economists believe that regional blocs permit more rapid (even if partial) trade liberalization. Others, such as Bhagwati, feel that they retard multilateral trade liberalization and lead to potential interbloc conflicts. Perhaps we can have the best of both worlds if trading blocs strive to reduce external as well as internal trade barriers and easily admit new members.

10.6 History of Attempts at Economic Integration

In this section, we briefly survey the history of attempts at economic integration, starting with the formation of the European Union, the European Free Trade Association, the North American Free Trade Area, and the Southern (American) Common Market, and then examining other attempts at economic integration among developing countries and among the Republics of the former Soviet Union.

10.6A The European Union

The *European Union (EU)*, then called the European Common Market, was founded by the Treaty of Rome, signed in March 1957 by West Germany, France, Italy, Belgium, the Netherlands, and Luxembourg, and came into being on January 1, 1958. The common external tariff was set at the average of the 1957 tariffs of the six nations. Free trade in industrial goods within the EU and a common price for agricultural products were achieved in 1968, and restrictions on the free movement of labor and capital were reduced by 1970. Membership increased to 15 after the United Kingdom, Denmark, and Ireland joined in 1973, Greece in 1981, Spain and Portugal in 1986, and Austria, Finland, and Sweden in 1995. On January 1, 1993, the EU removed all remaining restrictions on the free flow of goods, services, and resources (including labor) among its members, thus becoming a single unified market. By 2008, the EU had expanded to 27 members and represented the largest trading bloc in the world (see Case Study 10-1). Intra-EU trade has been estimated to be double what it would have been in the absence of integration. More than half of this trade expansion has been in intra-industry trade (see Section 6.4A).

The formation of the EU significantly expanded trade in industrial goods with nonmembers. This was due to (1) the very rapid growth of the EU, which increased its demand for imports of industrial products from outside the union, and (2) the reduction to very low

CASE STUDY 10-1 Economic Profile of the EU, NAFTA, and Japan

Table 10.1 provides an economic profile of the European Union (EU-27), the North American Free Trade Area (NAFTA), and Japan in 2010. The table shows that the EU-27 has 110 percent of NAFTA's population, 102 percent of its gross national income (GNI), and 89 percent of its weighted average GNI per capita. Total EU-27 merchandise exports and extra-EU-27 merchandise exports (i.e., exports to the rest of the world) are, respectively, 262 percent and 91 percent of NAFTA's total exports. Corresponding figures for total EU-27 imports and extra-EU-27 imports are, respectively, 200 percent and 74 percent. Japan has 25 percent of EU-27 population, 31 percent of its GNI, 127 percent of its per capita income, 43 percent of extra-EU-27 exports, and 34 percent of extra-EU-27 imports. With respect to NAFTA, Japan has 28 percent of its population, 32 percent of its GNI, 39 percent of its exports, and 26 percent of its imports.

TABLE 10.1. The EU, NAFTA, and Japan

Country	Population (millions)	GNI (billions)	GNI (per capita)	Exports (billions)	Imports (billions)
EU(15):	398.5	$16,100.8	$38,539	$4,558.4	$4,621.6
Of which:					
Germany	81.7	3,537.2	43,330	1,268.9	1,066.8
France	64.9	2,749.8	42,390	520.7	605.7
U.K.	62.2	2,399.3	38,540	405.7	560.1
Italy	60.5	2,125.8	35,090	447.5	483.8
Spain	46.1	1,462.9	31,650	245.6	314.3
New Entrants:	103.4	1,260.1	12,229	594.7	631.9
Of which:					
Poland	38.2	474.0	12,420	155.8	173.6
Total EU(27)	501.9	17,360.9	33,124	5,153.2	5,356.0
Extra-EU(27)	—	—	—	1,788.1	1,990.9
Canada	34.1	1,415.4	41,950	388.0	402.3
Mexico	113.4	1,012.3	9,330	298.3	310.6
U.S.	309.1	14,600.8	47,140	1,278.3	1,969.2
Total NAFTA	456.6	17,028.5	37,362	1,964.6	2,682.1
Japan	127.5	5,369.1	42,150	769.8	694.1

EU(15) includes: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden, and the United Kingdom. New Entrants (12) are: Bulgaria, Cyprus, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Romania, Slovak Republic, and Slovenia.
Sources: World Bank, *World Development Report 2012* (Washington, D.C.: World Bank, 2012) and World Trade Organization, *International Trade Statistics* (Geneva: WTO, 2011).

levels of the average tariff on imports of industrial products as a result of the Kennedy and Tokyo Rounds (initiated by the United States, which feared trade diversion). On the other hand, the formation of the EU resulted in trade diversion in agricultural commodities, particularly in temperate products, such as grain from the United States.

The development of a *common agricultural policy (CAP)* was particularly trouble some for the EU. The final outcome sacrificed consumers' interests to those of EU farmers in general, and French farmers in particular, by setting relatively high farm prices. The procedure is as follows. First, the EU determines common farm prices, and then it imposes tariffs so as always to make the price of imported agricultural products equal to the high established EU prices. These are the so-called variable import levies. The high farm support price level has also led to huge agricultural surpluses within the EU, high storage costs, and subsidized exports (see Section 9.3E on export subsidies and Case Study 9-4). This farm policy was a major obstacle to British entry into the EU because Britain kept agricultural prices low and instead aided its farmers by "deficiency payments" to raise their income to desired levels. It has also been responsible for some of the sharpest trade disputes with the United States and at the Uruguay Round and Doha Round negotiations (see Section 9.7).

At the Lomé Convention in 1975, the EU eliminated most trade barriers on imports from 46 developing nations in Africa, the Caribbean, and the Pacific region that were former colonies of EU countries. This treaty was renewed every five years—1980, 1985, 1990, and 1995—and the number of associate states (AS) rose to 71. Earlier, in 1971, the EU had granted generalized tariff preferences to imports of manufactured and semimanufactured products from developing nations. But textiles, steel, consumer electronics, shoes, and many other products of great importance to developing nations were excluded. Preferences were extended to trade in tropical products in the Tokyo Round in 1979. However, since these preferences fell short of the complete elimination of trade barriers granted to former colonies, a bitter controversy arose because of the alleged trade diversion. Quotas and tariffs on developing countries' exports were gradually reduced as a result of the Uruguay Round completed in December 1994 (see Section 9.7). In February 2000, *Lomé IV* expired and was replaced by a new agreement, the *Cotonou Agreement*, signed in Cotonou, Benin, in June 2000. The new agreement had the same general purpose as the Lomé Convention. The EU replaced the *Cotonou Agreement* in January 2008 with "new partnership agreements (NPAs) based on reciprocity" with the 79 countries involved, broken into six regional groups.

As pointed out earlier, the static welfare benefits resulting from the formation of the EU are estimated to be 1 to 2 percent of GDP, while the dynamic benefits are estimated to be much larger (see Case Study 10-2). Perhaps the greatest benefit has been political, resulting

CASE STUDY 10-2 Gains from the Single EU Market

At the beginning of 1993, all remaining restrictions to the free flow of goods, services, capital, and labor among member nations were eliminated so that the EU became a single, unified market. Over time, this was expected to result in substantial efficiency gains and other benefits to the EU. Table 10.2 shows that the EU's gross domestic product (GDP) was expected to increase by 0.2 percent from the removal of nontariff trade barriers, 2.2 percent from the removal of production barriers, 1.65 percent from economies of scale, and 1.25 percent from intensified competition, for an overall total (one-time) gain of 5.3 percent of the EU's GDP in 1988. This was equivalent to about $265 billion. In addition, the overall rate of inflation was expected to fall by 6.1 percent and 1.8 million additional jobs were expected to be created, thereby reducing the average rate of unemployment in the EU by 1.5 percentage points. The EU92 Program also induced large foreign direct investments from the United States and Japan in anticipation of a possible increase in EU protectionism against outsiders. In 2003, the European Commission actually put the gains of EU92 at about 2 percent of EU's GDP.

(continued)

CASE STUDY 10-2 Continued

TABLE 10.2. Potential Benefits from a Fully Integrated Internal Market in the EU

	Percent of EU's 1988 GDP
Gains from	
Removal of nontariff trade barriers	0.20
Removal of production barriers	2.20
Economies of scale	1.65
Intensified competition	1.25
Overall total gains	5.30

Source: P. Cecchini, *The European Challenge: 1992* (Aldershot, England: Wildwood House, 1988).

from unifying into a single economic community nations, such as Germany and France, that were once bitter enemies. The United States has been of two minds on European unity, supportive yet wary of losing influence. In 1986, the EU amended the *Treaty of Rome* with the *Single European Act*, which provided for the removal of all remaining barriers to the free flow of goods, services, and resources among members. This was actually achieved with the *EU 1992 Program*, which turned the EU into a single unified market at the beginning of 1993. This led to the pouring in of foreign direct investments into the EU out of fear of increased protectionism against outsiders.

Other highlights in the operation of the EU are as follows: (1) Member nations have adopted a common *value-added tax system*, under which a tax is levied on the value added to the product at each stage of its production and passed on to the consumer. (2) The *Commission* (the executive body of the EU headquartered in Brussels) proposes laws, monitors compliance with treaties, and administers common policies such as antitrust policies. (3) The *Council of Ministers* (whose members represent their own national governments) makes final decisions but only on the recommendation of the Commission. There is also a *European Parliament* (with 751 members elected by direct vote in the member nations every five years but without much power at present) and a *Court of Justice* (with power to rule on the constitutionality of the decision of the Commission and the Council). (4) Plans have also been drawn for full monetary union, including harmonization of monetary and fiscal policies, and eventual full political union (see Section 20.4B).

In May 2004, ten countries, mostly from the former communist bloc in Central and Eastern Europe, became members of the European Union. The ten countries are Poland, Hungary, the Czech Republic, the Slovak Republic, Slovenia, Estonia, Lithuania, Latvia, Malta, and Cyprus. Bulgaria and Romania joined in 2008, and others, such as Turkey, are negotiating accession. With the admission of the 12 new members, the European Union is now comparable in size to NAFTA (see Table 10.1).

10.6B The European Free Trade Association

In 1960 the free trade area known as the European Free Trade Association (EFTA) was formed by the "outer seven" nations: the United Kingdom, Austria, Denmark, Norway, Portugal, Sweden, and Switzerland, with Finland becoming an associate member in 1961.

The EFTA achieved free trade in industrial goods in 1967, but only a few special provisions were made to reduce barriers on trade in agricultural products.

The maintenance by each nation of its own trade barriers against nonmembers can lead to the problem of trade deflection. This refers to the entry of imports from the rest of the world into the low-tariff member of the association to avoid the higher tariffs of other members. To combat trade deflection requires checking the original source and the final country of destination of all imports. The problem, of course, does not arise in a customs union because of its common external tariff, and it is much less serious in preferential trade arrangements, where only small tariff preferences are granted to members.

Iceland acceded the EFTA in 1970, Finland became a full member in 1986, and Liechtenstein, a part of the Swiss customs area, in 1991. However, in 1973, the United Kingdom and Denmark left the EFTA and, together with Ireland, joined the EU, as did Portugal in 1986. Thus, in 1991, the EFTA had seven members (Austria, Finland, Iceland, Liechtenstein, Norway, Sweden, and Switzerland) with headquarters in Geneva. On January 1, 1994, the EFTA joined the EU to form the European Economic Area (EEA), a customs union that will eventually allow the free movement of most goods, services, capital, and people among the 17 member nations (Switzerland and Liechtenstein rejected the treaty in December 1992 and Liechtenstein cannot join without Switzerland), with a combined population of 385 million people. In 1995, Austria, Finland, and Sweden left the EFTA and joined the EU, leaving the EFTA with only four members (Switzerland, Norway, Iceland, and Liechtenstein).

10.6c The North American and Other Free Trade Agreements

In September 1985, the United States negotiated a free trade agreement with Israel. This was the first bilateral trade agreement signed by the United States. It provided for bilateral reductions in tariff and nontariff barriers to trade in goods between the two countries. Trade in services was also liberalized, and some provisions were made for the protection of intellectual property rights.

Although the United States and Canada have had a free trade agreement in autos since 1965, a comprehensive economy-wide, free trade agreement had proved elusive for over a century. In 1988, such a free trade agreement was finally negotiated. By the time the pact went into effect in January 1, 1989, Canada was already by far the largest trading partner of the United States, with two-way yearly trade of about \$150 billion (75 percent of which was already duty-free). The pact called for the elimination of most of the remaining tariff and nontariff trade barriers between the two countries by 1998. As a result of the agreement, Canada was estimated to have grown 5 percent faster and the United States 1 percent faster than without the agreement, and hundreds of thousands of jobs were created on both sides of the border.

The pact also established for the first time a set of rules governing trade in services, with each country agreeing to treat each other's service sector in the same way it treated its own and reducing the red tape for accountants, lawyers, engineers, and other professionals in crossing the border. In addition, the pact dropped all remaining restrictions on the shipment of energy between the two countries and reduced restrictions on investments in each other's markets.

In September 1993, the United States, Canada, and Mexico signed the North American Free Trade Agreement (NAFTA), which took effect on January 1, 1994. This agreement is to eventually lead to free trade in goods and services over the entire North American area.

NAFTA will also phase out many other barriers to trade and reduce barriers to cross-border investment among the three countries. With $40 billion of exports to and $41 billion of imports from the United States in 1993, Mexico was already the United States' third largest trading partner after Canada and Japan at the time the agreement took effect. The main impact of NAFTA was on trade between the United States and Mexico. (Canada only joined in the negotiations to ensure that its interests were protected.)

The implementation of NAFTA benefits the United States by increasing competition in product and resource markets, as well as by lowering the prices of many commodities to U.S. consumers. In fact, between 1994 and 2008, two-way trade between the United States and Mexico more than tripled. Because the U.S. economy is more than 15 times larger than Mexico's economy, the U.S. gains from NAFTA as if a proportion of its GDP were much smaller than Mexico's. Furthermore, with wages more than six times higher in the United States than in Mexico, NAFTA was expected to lead to a loss of unskilled jobs, but an increase of skilled jobs, for an overall net increase in employment in the United States between 90,000 and 160,000 (see *Inter-American Development Bank*, 2002). A more recent study by *Hufbauer and Schott* (2005), however, concluded that the net gain in U.S. jobs as a result of NAFTA may have been much smaller (and may even have resulted in a small net loss). States (such as Alabama and Arkansas) suffered while high-wage areas gained, but with a 15-year phase-in period and about $3 billion assistance to displaced workers, the harm to workers in low-income areas in the United States was minimized.

Free trade access to Mexico allows U.S. industries to import labor-intensive components from Mexico and keep other operations in the United States rather than possibly losing all jobs in the industry to low-wage countries. Some of the jobs that Mexico gained have not in fact come from the United States but from other countries, such as Malaysia, where wages are now roughly equal to Mexico's. As a condition for congressional approval of NAFTA, the United States also negotiated a series of supplemental agreements with Mexico governing workplace and environmental standards (to prevent U.S. firms from moving their operations to Mexico to take advantage of much more lax labor and environmental regulations), as well as to protect some American industries against import surges that might threaten them.

The implementation of NAFTA benefited Mexico by leading to greater export-led growth resulting from increased access to the huge U.S. market and by increasing inward foreign direct investments. Mexico suffered a net loss of jobs and incomes in agriculture, but these losses were more than matched by net increases in industry. With time, increasing employment opportunities and rising wages in industry are also expected to reduce the pressure for Mexicans to emigrate to the United States. Mexico's ability to benefit from NAFTA has been limited, however, by weak economic institutions and inadequate structural reforms of the economy (see Case Study 10-3).

In 1993, the United States launched the Enterprise for the American Initiative (EAI), which led to the formation of the Free Trade Area of the Americas (FTAA) in 1998, whose ultimate goal is hemispheric free trade among the 34 democratic countries of North and South America. Negotiations are proving to be difficult and are not expected to succeed anytime soon. Since 2001, the United States also signed free trade agreements (FTAs) with Australia, Bahrain, Chile, Jordan, Morocco, Oman, Peru, and Singapore. Also operational is the United States-Dominican Republic-Central American Free Trade Agreement (US-DR-CAFTA) with Costa Rica, El Salvador, Guatemala, Honduras, and Nicaragua, besides the Dominican Republic. Ratified in 2001 was the U.S. FTA with Korea, Panama, and Colombia. The United States is negotiating still other FTAs with other countries.

CASE STUDY 10-3 Mexico's Gains from NAFTA—Expectations and Outcome

Table 10.3 shows the long-run simulations results of NAFTA's impact on Mexico to the year 2005 and compares these to the actual outcome. During the 1995–2005 decade, Mexican real GDP was estimated to grow at a rate of 5.2 percent per year with NAFTA, as compared with 3.8 percent without NAFTA. Also, NAFTA was expected to (1) reduce the Mexican inflation rate from 14.5 percent to 9.7 percent per year and the short-term interest rate from 18.3 percent to 13.0 percent, (2) increase the inflow of foreign direct investments (FDI) from $6.0 billion to $9.2 billion per year and the growth of exports from 8.3 to 10.4 percent, and (3) raise the trade deficit from $9.7 billion to $14.9 billion and net financial inflows from $10.6 billion to $14.7 billion per year.

The actual results, as yearly averages from 1994 to 2005, were as follows: the average growth rate of real GDP of 2.8 percent per year, a rate of inflation of 13.9 percent, a short-term interest rate of 18.7 percent, an inflow of FDI $16.9 billion, a growth of exports of 9.2 percent, a trade deficit of $7.7 billion, and net financial inflows of $16.8 billion. The actual results for 1994 to 2008 were similar to those for 1994 to 2005 (see the last column of Table 10.3). Thus, we see that Mexico did not realize most of the expectations from NAFTA because of its deep economic crisis in 1995, because of the slow growth of the United States in 2001–2002, and, more importantly, because of weak economic institutions and inadequate structural reforms. If we removed from the data 1995 (the recession year in Mexico) and also 2001 and 2002 (the years of recession and slow growth in the United States, which reduced U.S. imports from Mexico), the average annual growth of real GDP in Mexico would be 4.5 percent for 1994–2005 and 4.1 for 1994–2008.

TABLE 10.3. NAFTA's Impact on the Mexican Economy (Yearly Averages: 1994–2005 and 1994–2008)

	Estimates with NAFTA	Without NAFTA	Difference	Actual Results 1994–2005	Actual Results 1994–2008
Growth of real GDP (%)	5.2	3.8	1.4	2.8	2.9
Inflation rate (%)	9.7	14.5	−4.8	13.9	12.0
Short-term interest rate (%)	13.0	18.3	−5.3	18.7	16.5
Inflow of FDI (billion USD)	9.2	6.0	3.2	16.9	18.2
Growth of exports (%)	10.4	8.3	2.1	9.2	8.4
Trade deficit (billion USD)	14.9	9.7	5.2	7.7	9.6
Net financial capital inflows (billion USD)	14.7	10.6	4.1	16.8	16.2

Sources: L. Klein and D. Salvatore, ''Welfare Effects of the NAFTA,'' *Journal of Policy Modeling*, April 1995, pp. 163–176; G. C. Hufbauer and J. J. Schott, *NAFTA Revisited* (Washington, D.C.: Institute for International Economics, 2005); and ''Measuring the Economic Effects of NAFTA on Mexico,'' *CEFifo Forum*, No. 4 Winter 2010, pp. 31–37.

In recent years, the EU and other countries have also been very active in signing FTAs. The EU has FTAs with Algeria, Egypt, Israel, Jordan, Lebanon, Morocco, Tunisia, and Turkey as part of an effort to create a Euro Mediterranean Free Trade Area (EMFTA). The EU also has FTAs with Norway and Switzerland; South Africa and South Korea; Chile, Colombia, Mexico and Peru; and with 12 other smaller nations, and is negotiating an FTA with Mercosur and the Gulf Cooperation Council (which includes Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, and United Arab Emirates).

Japan has FTAs with ASEAN, India, Mexico, and Switzerland and is negotiating with still other countries. Canada has FTAs with the United States and Mexico (NAFTA) and the European Free Trade Association (EFA), as well as with Israel, Colombia, Costa Rica, Honduras, and Peru; and it is negotiating with other countries as well. By 2009, there were nearly 300 FTAs from just about 50 in 1990. Today, most countries belong to multiple FTAs. This spaghetti-bowl proliferation of bilateral and regional FTAs is regarded by some as a stumbling block to a freer multilateral trading system.

10.6D Attempts at Economic Integration among Developing Countries

The success of the EU encouraged many attempts at economic integration among groups of developing nations as a means of stimulating the rate of economic development. Most of these attempts, however, met with only limited success or failed. Examples are (the complete list of all RTAs is given in Appendix A10.2):

1. The *Central American Common Market (CACM)*, established by Costa Rica, El Salvador, Guatemala, Honduras, and Nicaragua in 1960, which was dissolved in 1969 and revived in 1990.
2. The *Latin American Free Trade Association (LAFTA)*, established in 1960 by Mexico and most of South America, and its subgroup (the Andean Community, formed by Bolivia, Chile, Colombia, Ecuador, Peru, and Venezuela in 1969), which hoped to accelerate the process of integration and establish a common market; in 1980, the LAFTA was superseded by the Latin American Integration Association (LAIA).
3. The *Southern Common Market (Mercosur)*, formed by Argentina, Brazil, Paraguay, and Uruguay in 1991. It was joined by Bolivia and Chile as associate members in 1996, Peru in 2003, and Colombia, Ecuador, and Venezuela in 2004. Venezuela is in the process of becoming a full member in 2012.
4. The *Free Trade Area of the Americas (FTAA)* established in 1998 with the goal of free trade among the 34 democratic countries of North and South America.
5. The *Caribbean Free Trade Association (CARIFTA)*, set up in 1968 and transformed into a common market *(CARICOM)* in 1973 with the membership of Antigua and Barbuda, Bahamas, Barbados, Belize, Dominica, Grenada, Guyana, Haiti, Jamaica, Montserrat, St. Kitts-Nevis, St. Lucia, St. Vincent and the Grenadines, Suriname, and Trinidad and Tobago.
6. The *East African Community (EAC)*, established in 1967 by Kenya, Tanzania, and Uganda.
7. The *West African Economic and Monetary Union (WAEMU)*, which includes Benin, Burkina Faso, Cote d'Ivoire, Guinea Bissau, Mali, Niger, Senegal, and Togo.
8. The 14-member *Southern Africa Development Community (SADC)*, extending from Angola, Botswana, the Democratic Republic of Congo, Lesotho, Madagascar, Malawi, Mauritius, Mozambique, Namibia, South Africa, Swaziland, Tanzania, Zambia, and Zimbabwe.

9. The *Association of South East Asian Nations (ASEAN)*, which includes Brunei Darussalam, Cambodia, Indonesia, Laos, Malaysia, the Philippines, Singapore, Myanmar, Thailand, and Vietnam, though primarily a political association, in 1977 decided that it would also move toward a common market.

These customs unions are (or were) to a large extent explicitly trade diverting to encourage industrial development. Perhaps the greatest stumbling block to successful economic integration among groups of developing nations is the uneven distribution of benefits among members. Since benefits are likely to accrue mainly to the most advanced nations in the group, lagging nations are likely to withdraw, causing the attempt at economic integration to fail. One way to avoid this difficulty is to provide investment assistance through industrial planning (i.e., assign some industries to each member nation). Although this tactic was tried in the Central American Common Market, the effort failed nevertheless and the union dissolved in 1969 (although, as noted earlier, it was revived in 1990).

Another difficulty is that many developing nations are not willing to relinquish part of their newly acquired sovereignty to a supranational community body, as is required for successful economic integration. Other difficulties arise from lack of good transportation and communication among member nations, the great distance that often separates members, and the basically complementary nature of their economies and competition for the same world markets for their agricultural exports. For these reasons, economic integration among developing countries cannot be said to have been very successful in most cases. One success story is Mercosur (see Case Study 10-4).

CASE STUDY 10-4 Economic Profile of Mercosur

Table 10.4 provides an economic profile of Mercosur or Southern Common Market, which was formed in 1991 by Argentina, Brazil, Paraguay, and Uruguay. Bolivia and Chile became associate members in 1996, Peru in 2003, and Colombia, Ecuador, and Venezuela in 2004. Venezuela became a full member in 2012. Mercosur was scheduled to become a custom union in 1995, but the process had not yet completed as of mid-2012. The table shows that in 2010 the

TABLE 10.4. Mercosur

Country	Population (millions)	GNI (billions)	GNI (per Capita)	Exports (billions)	Imports (billions)
Argentina	40.4	$343.6	$8, 450	$68.2	$56.5
Brazil	194.9	1, 830.4	9, 390	201.9	191.5
Paraguay	6.5	19.0	2, 940	4.5	10.0
Uruguay	3.4	35.6	10, 590	6.7	8.6
Mercosur	245.2	2, 222.8	9, 081	281.3	266.6
U.S.	309.1	14, 600.8	47, 140	1, 278.3	1, 969.2
NAFTA	456.6	17, 028.5	37, 362	1, 964.6	2, 682.1
EU (27)	501.9	17, 360.9	33, 124	5, 1533.2	5, 356.0
Extra-EU (27)	—	—	—	1, 788.1	1, 990.9
Japan	127.5	5, 369.1	42, 150	769.8	694.1

Sources: World Bank, *World Development Report 2012* (Washington, D.C.: World Bank, 2012) and World Trading Organization, *International Trade Statistics* (Geneva: WTO, 2011).

(continued)

CASE STUDY 10-4 Continued

population of Mercosur was 245.2 million, gross national income (GNI) was $2,222.8 billion, average per capita GNI was $9,081, total merchandise exports were $281.2 billion, and imports were $266.6 billion.

Trade among Mercosur countries increased from $4.1 billion (8.9 percent of its total trade) in 1990 to $21.1 billion (12.9 percent of its total trade) in 2005, but according to a World Bank study (Yeats, 1998) a great deal of it seems to be have been trade diversion from more efficient producers outside the bloc. In January 1999, Brazil faced a deep economic and financial crisis and it devalued its currency (the real) very steeply. This encouraged Argentinean imports from Brazil, discouraged its exports, and made Argentina's recession even worse. In January 2002, Argentina was forced to devalue its currency in the face of complete economic, financial, and political collapse. All this strained relations between the two main members of Mercosur and even led to fears of its collapse. By 2003, however, growth had resumed and so did progress toward turning Mercosur into a common market.

Starting in 2003, Mercosur, under the leadership of Brazil, sought to negotiate a free trade agreement with the Andean Community of Nations, as well as with other South American nations, in order to increase its bargaining strength vis-à-vis the United States in pursuing free trade for all of the Americas under the Free Trade Area of the Americas (FTAA). Case Study 10-5 shows the changes in the patterns of trade with economic integration.

10.6E Economic Integration in Central and Eastern Europe and in the Former Soviet Republics

In 1949, the Soviet Union formed the Council of Mutual Economic Assistance (CMEA or COMECON) with the communist bloc nations in Eastern Europe (Bulgaria, Czechoslovakia, East Germany, Hungary, Poland, and Romania) plus Mongolia (Cuba, North Korea, and Vietnam joined later). The purpose of this agreement was to divert trade from Western nations and achieve a greater degree of self-sufficiency among communist nations. Under this arrangement, most CMEA members imported oil and natural gas from the Soviet Union in exchange for industrial and farm products.

In CMEA member countries, the state decided and controlled all international transactions through a number of state trading companies, each handling some product line. Under such a system, the types and amounts of goods imported were determined by the requirements of the national plan over and above domestically available products (i.e., to close the gap in the "material balance"). The state then decided which goods to export in order to pay for the required imports. Political considerations played at least as important a role as economic considerations in such a trade, while comparative advantage and relative commodity prices did not have any direct role. In fact, these centrally planned economies (i.e, economies where prices are not determined by market forces but by government directives) generally emphasized self-sufficiency and tended to regard international trade as a necessary evil to close the material balance and obtain goods and services (such as high-technology products) that the nation could not supply for itself, or within the CMEA.

Trade among CMEA economies was generally conducted on the basis of bilateral agreements and bulk purchasing. Bilateral agreements often involved *barter trade* and

CASE STUDY 10-5 Changes in Trade Patterns with Economic Integration

Table 10.5 shows the value of total merchandise exports, intra-regional-trade-agreement (RTA) exports, and intra-RTA exports as a percentage of the total RTA exports of the EU, NAFTA, and Mercosur in 1990, 1995, 2000, 2005, and 2010. The table shows that the EU has the largest percentage of intra-RTA trade and Mercosur has the smallest. However, intra-RTA trade grew faster in Mercosur between 1990 and 1995 (i.e., in the four years after its creation in 1991) and in NAFTA from 1995 to 2000 (i.e., after its creation in 1994). Intra-Mercosur trade as a percentage of its total trade was 12.9 in 2005 and 15.6 in 2010, down from 20.1 in 2000, because of the economic crisis in Brazil and Argentina between 2001 and 2002. By 2003, however, intra-Mercosur trade had resumed its growth.

TABLE 10.5. Total and Intra-EU, NAFTA, and Mercosur Merchandise Exports in 1990, 1995, 2000, 2005, and 2010 (in billions of dollars and percentages)

EU Exports (in billion dollars)			
Year	Total	Intra-EU	Intra-EU as Percentage of Total
1990 (EU-15)	$1, 482.4	$ 979.7	66.1
1995 (EU-15)	1, 936.8	1, 295.3	66.9
2000 (EU-15)	2, 251.0	1, 392.3	61.9
2005 (EU-27)	4, 065.9	2, 755.6	67.8
2010 (EU-27)	5, 153.2	3, 365.1	65.3
NAFTA Exports (in billion dollars)			
Year	Total	Intra-NAFTA	Intra-NAFTA as Percentage of Total
1990	$ 561.9	$239.6	42.8
1995	856.5	394.3	46.0
2000	1, 224.9	681.6	55.6
2005	1, 475.8	824.6	55.9
2010	1, 964.6	955.7	48.6
Mercosur Exports(in billion dollars)			
Year	Total	Intra-Mercosur	Intra-Mercosur as Percentage of Total
1990	$ 46.4	$ 4.1	8.9
1995	70.5	14.5	20.5
2000	84.6	17.7	20.1
2005	164.0	21.1	12.9
2010	281.3	43.9	15.6

Source: World Trade Organization, *International Trade Statistics* (Geneva: WTO, 2011).

countertrade, in which one good was exchanged for another, or at least the attempt was made to balance trade with each nation individually. The reason was that any surplus of “convertible” rubles (the unit of account in CMEA trade) could not be spent to import goods and services from any nation other than the one from which the surplus was accumulated.

For example, if Poland exported more than it imported from the Soviet Union, Poland could only use the surplus rubles accumulated to purchase Soviet goods. Bulk purchasing refers to the agreement of a state trading company to purchase a specified quantity of a commodity for a year or for a number of years from a state trading company of another nation.

Since 1989, communist regimes collapsed all over Eastern Europe and in the Soviet Union, East and West Germany were reunited, Yugoslavia disintegrated, and the Soviet Union was dissolved. These momentous political changes were triggered, at least in part, by the economic failures of central planning. All 12 Central and Eastern European Countries (CEEC) and the 15 Newly Independent States (NIS) of the former Soviet Union have and are continuing to restructure their economies and their foreign trade along market lines. This is a monumental task after many decades of central planning and gross inefficiencies. The establishment of a market economy requires (1) freeing prices and wages from government control (so that market forces of demand and supply can freely allocate resources), (2) transferring productive resources from government to private ownership (i.e., privatizing the economy), (3) opening the economy to competition and liberalizing international trade (i.e., replacing state trading with trade based on market principles), and (4) establishing the legal and institutional framework necessary for the functioning of a market economy (such as property rights, a Western-style banking system, a capital market, cost accounting, business law, etc.).

In the majority of countries, severe economic dislocations in the form of increasing unemployment, high inflation, huge budget deficits, unsustainable international debts, and disrupted trade relations accompanied the collapse of traditional central planning. To date, Poland, Hungary, the Czech Republic (which arose from the breakup of Czechoslovakia into the Czech and the Slovak Republics in 1992), Slovenia (which broke away from former Yugoslavia in 1991), and Estonia (a Baltic State and former Soviet Republic) have made the most progress toward restructuring their economies and are growing rapidly. Other CEEC nations are lagging somewhat behind, and most NIS nations (including Russia) are only about two-thirds through the process. Particularly difficult were the privatization of large industries and the establishment of the institutions required for a democratic society and a market economy.

Since 1989 there has been a shift in the direction of CEEC and NIS trade. In 1980, 51 percent of CEEC and NIS exports went to other CEEC and NIS countries, 28 percent to industrial countries, and 21 percent to developing countries. By 2008, these values had changed to 20 percent, 63 percent, and 7 percent, respectively. Most CEEC countries have had and most NIS countries are having difficulties expanding trade with the West because of the generally low quality of their manufactured products and protectionism in industrial countries. For the restructuring process to be successful, however, CEEC and NIS countries need large amounts of foreign aid from industrial countries, easier access for their exports in industrial markets, huge foreign direct investments (FDI), and inflows of modern technology from industrial countries.

At the end of 1991, the Soviet Union was formally dissolved, and, under the leadership of Russia, most former Soviet Republics (now called the Newly Independent States or NIS) formed the Commonwealth of Independent States (CIS). In 1991, the EU signed association agreements with Poland, Hungary, and Czechoslovakia, giving those countries free trade access to the EU, except in some important products, such as steel, textile, and agricultural products. By 1996, the agreement had been extended to 10 CEEC nations. In

1992, Poland, Hungary, the Czech Republic, and Slovakia formed the Central European Free Trade Association (CEFTA) and the Baltic States of Estonia, Latvia, and Lithuania formed the Baltic Free Trade Agreement (BAFTA), but they are now all members of the EU.

In March 1998, the Czech Republic, Estonia, Hungary, Poland, and Slovenia began negotiations to become members of the European Union, and in February 2000, Bulgaria, Latvia, Lithuania, Romania, and the Slovak Republic followed suit. In 2004, ten Central and Eastern European countries (Poland, Hungary, the Czech Republic, Slovakia, Slovenia, Estonia, Lithuania, Latvia, Malta, and Cyprus) became EU members in 2004, and Bulgaria and Romania joined in 2008. Albania, the countries of former Yugoslavia (Bosnia-Herzegovina, Croatia, Serbia, Montenegro, and Macedonia, with the exception of Slovenia), as well as Turkey have started negotiation for admission into the EU. The former Soviet Republics (Russia, Armenia, Azerbaijan, Belarus, Georgia, Kazakhstan, the Kyrgyz Republic, Moldova, Tajikistan, Turkmenistan, Ukraine, and Uzbekistan—with the exception of the Baltic States of Estonia, Latvia, and Lithuania) are further behind in their restructuring process and are not in line to join the EU.

SUMMARY

1. Economic integration refers to the commercial policy of discriminatively reducing or eliminating trade barriers only among the nations joining together. In a preferential trade arrangement (such as the British Commonwealth Preference Scheme), trade barriers are reduced on trade among participating nations only. A free trade area (e.g., the EFTA and NAFTA) removes all barriers on trade among members, but each nation retains its own barriers on trade with nonmembers. A customs union (e.g., the EU) goes further by also adopting a common commercial policy toward the outside world. A common market (the EU since 1993 and Mercosur in the future) goes still further by also allowing the free movement of labor and capital among member nations. An economic union harmonizes (e.g., Benelux) or even unifies (e.g., the United States) the monetary and fiscal policies of its members.

2. The static, partial equilibrium effects of customs unions are measured in terms of trade creation and trade diversion. Trade creation occurs when some domestic production in a union member is replaced by lower-cost imports from another member nation. This increases specialization in production and welfare in the customs union. A trade-creating customs union also increases the welfare of nonmembers, since some of the increase in its real income spills over into increased imports from the rest of the world.

3. Trade diversion occurs when lower-cost imports from outside the customs union are replaced by higher-cost imports from another union member. By itself, this reduces welfare because it shifts production away from comparative advantage. A trade-diverting customs union leads to both trade creation and trade diversion and may increase or reduce welfare, depending on the relative strength of these two opposing forces.

4. The theory of customs unions is a special case of the theory of the second best. This postulates that when all conditions required to reach maximum social welfare or Pareto optimum cannot be satisfied, trying to satisfy as many of these conditions as possible does not necessarily or usually lead to the second-best welfare position. The conditions under which the formation of a customs union is more likely to lead to trade creation and increased welfare are well known theoretically. Other static effects of customs unions are administrative savings and greater bargaining strength. However, a customs union's effect on individual members' terms of trade is unclear.

5. Besides the static welfare gains, the nations forming a customs union are likely to receive significant dynamic benefits from increased competition, economies of scale, stimulus to investment, and better utilization of economic resources.

6. The EU was formed in 1958 by West Germany, France, Italy, Belgium, the Netherlands, and Luxembourg. They were joined by the United Kingdom, Denmark, and Ireland in 1973; Greece in 1981; Spain and Portugal in 1986; Austria, Finland, and Sweden in 1995; and in 2004 by Poland, Hungary, the Czech Republic, the Slovak Republic, Slovenia, Estonia, Lithuania, Latvia, Malta, and Cyprus. Bulgaria and Romania joined in 2008. Free trade in industrial goods and common agricultural prices were achieved in 1968 and a full common market in 1993. The EU led to trade expansion in industrial goods but trade diversion in agricultural products. In 1993, the United States, Canada, and Mexico signed the North American Free Trade Agreement (NAFTA). The many attempts at economic integration among developing nations have had only limited success, except for the Southern Common Market, or Mercosur. Its members are Brazil, Argentina, Paraguay, and Uruguay. During the past decade, there has been a proliferation of free trade agreements (FTAs).

A LOOK AHEAD

In the next chapter, we examine the special trade problems faced by developing countries. We will find that international trade can contribute significantly to the development of poor nations but that it also gives rise to some special problems requiring joint action by both developed and developing nations.

KEY TERMS

Baltic Free Trade Agreement (BAFTA), p. 321
Bilateral agreements, p. 318
Bulk purchasing, p. 320
Central and Eastern European Countries (CEEC), p. 320
Central European Free Trade Association (CEFTA), p. 321
Centrally planned economies, p. 318
Common market, p. 302
Commonwealth of Independent States (CIS), p. 320
Council of Mutual Economic Assistance (CMEA) or (COMECON), p. 318
Customs union, p. 302
Duty-free zones or free economic zones, p. 302
Economic integration, p. 301
Economic union, p. 302
European Economic Area (EEA), p. 313
European Free Trade Association (EFTA), p. 312
European Union (EU), p. 302
Free trade area, p. 301
Newly Independent States (NIS), p. 320
North American Free Trade Agreement (NAFTA), p. 313
Preferential trade arrangements, p. 301
State trading companies, p. 318
Southern Common Market (Mercosur), p. 316
Tariff factories, p. 308
Theory of the second best, p. 306
Trade-creating customs union, p. 302
Trade creation, p. 302
Trade deflection, p. 313
Trade diversion, p. 304
Trade-diverting customs union, p. 304
Variable import levies, p. 311

QUESTIONS FOR REVIEW

1. What is meant by economic integration? a preferential trade arrangement? a free trade area? a customs union? a common market? an economic union? Give an example of each.
2. What is meant by trade creation? What static welfare effects will a trade-creating customs union have on member nations and on the rest of the

world? How do these static welfare effects arise? How are they measured?

3. What is meant by trade diversion? What static welfare effects will a trade-diverting customs union have on member nations and on the rest of the world? How do these static welfare effects arise? How are they measured?

4. What is the theory of the second best? In what way is the theory of customs unions an example of the theory of the second best?

5. Under what conditions is the formation of a customs union more likely to lead to trade creation and increased welfare?

6. What dynamic benefits are the nations forming a customs union likely to receive? How do they arise? How large are they?

7. What was the effect of the formation of the EU on trade in industrial and agricultural products with the rest of the world?

8. What is the magnitude of the static and dynamic benefits to members resulting from the formation of the EU?

9. What free trade agreements have been negotiated by the United States? What is NAFTA?

10. How does the EFTA compare with the EU?

11. What is Mercosur? Why have attempts at economic integration among developing nations generally met with limited success or failure?

12. What is the CMEA? What is required for economic restructuring and integrating the countries of Eastern Europe and the former Soviet Union into the world economy?

13. What are CEFTA and BAFTA? What was their ultimate aim?

PROBLEMS

***1.** Suppose that the autarky price of commodity X is \$10 in Nation A, \$8 in Nation B, and \$6 in Nation C, and that Nation A is too small to affect prices in Nation B or C by trading. If Nation A initially imposes a nondiscriminatory ad valorem tariff of 100 percent on its imports of commodity X from Nations B and C, will Nation A produce commodity X domestically or import it from Nation B or Nation C?

***2.** Starting with the given of Problem 1:

(a) If Nation A subsequently forms a customs union with Nation B, will Nation A produce commodity X domestically or import it from Nation B or Nation C?

(b) Is the customs union that Nation A forms with Nation B trade creating, trade diverting, or neither?

***3.** Suppose that the autarky prices of commodity X in Nations A, B, and C are the same as in Problem 1, and that Nation A is too small to affect prices in Nations B and C by trading. If Nation A initially imposes a nondiscriminatory ad valorem tariff of 50 percent (rather than 100 percent) on imports of commodity X from Nations B and C, will Nation A produce commodity X domestically or import it from Nation B or Nation C?

4. Starting with the given of Problem 3:

(a) If Nation A subsequently forms a customs union with Nation B, will Nation A produce commodity X domestically or import it from Nation B or Nation C?

(b) Is the customs union that Nation A forms with Nation B trade creating, trade diverting, or neither?

5. Draw a figure illustrating the effects of a trade-creating customs union.

6. Measure the welfare gain of a nation joining this customs union.

7. Draw a figure illustrating the effects of a trade-diverting customs union that *reduces* the welfare of a nation joining it.

*= Answer provided at www.wiley.com/college/salvatore.

8. Measure the net welfare loss suffered by a nation joining this customs union.

9. Draw a figure illustrating the effects of a trade-diverting customs union that *increases* the welfare of a nation joining it.

10. Measure the net welfare gain of a nation joining a trade-diverting customs union that increases the welfare of the nation.

11. What are the factors that determine whether a trade-diverting customs union leads to a net increase or decrease in the welfare of a member nation?

12. Draw a figure showing what happens if country A forms a customs union with country B only, but the tariff-inclusive prices in country C are less than the free trade prices in country B.

13. Explain why the 1988 U.S.-Canada Free Trade Agreement created much less controversy in the United States than NAFTA, which included Mexico.

14. Indicate the possible cost and benefit to the United States from the movement to a single unified market by the European Union at the beginning of 1993.

APPENDIX

This appendix presents the general equilibrium analysis of the static effects of a trade-diverting customs union and presents the chronology of the growth of regionalism in the postwar trading system and its acceleration in recent years.

A10.1 General Equilibrium Analysis of the Static Effects of a Trade-Diverting Customs Union

In Section 10.3, we analyzed the static, partial equilibrium welfare effects of the formation of a trade-diverting customs union. In this appendix, we examine these static welfare effects within the more advanced general equilibrium framework. This brings out some aspects of the trade-diverting customs union not evident from the partial equilibrium analysis. Together they give a fairly complete picture of the static welfare effects resulting from the formation of a customs union.

The general equilibrium analysis of a trade-diverting customs union is illustrated in Figure 10.3. The figure repeats the production frontier of Nation 2 in Figure 8.5. We assume for simplicity that Nation 2 is too small to affect the relative price of commodity X in (large) Nations 1 and 3.

With a nondiscriminatory ad valorem tariff of 100 percent on imports of commodity X, Nation 2 produces at point F, where the marginal rate of transformation, or slope of its transformation curve, equals the tariff-inclusive relative price of commodity X from Nation 1 of $P'_1 = 2$ (not shown in the figure). However, since Nation 2 collects the tariff, it consumes at point H' on indifference curve II′ by exchanging 30Y for 30X with Nation 1 along $P_1 = 1$ where $P'_1 = 2$ is tangent to indifference curve II′ (exactly as in Figure 8.5).

If Nation 2 now forms a customs union with Nation 3, it will import commodity X from Nation 3 instead, at the free trade relative commodity price of $P_3 = 1.5$ in Nation 3. Nation 2 might then consume at point B' along the $P_3 = 1.5$ line. Since point B' involves less of both commodities than point H', point B' must be on a lower indifference curve (not shown in Figure 8.5). This confirms the partial equilibrium results shown in Figure 10.2, where Nation 2 suffered a net loss of welfare by forming a customs union with Nation 3.

However, with different tastes, Nation 2 might have consumed at point H^* before the formation of the customs union and at point B^* afterward. Since point B^* involves the

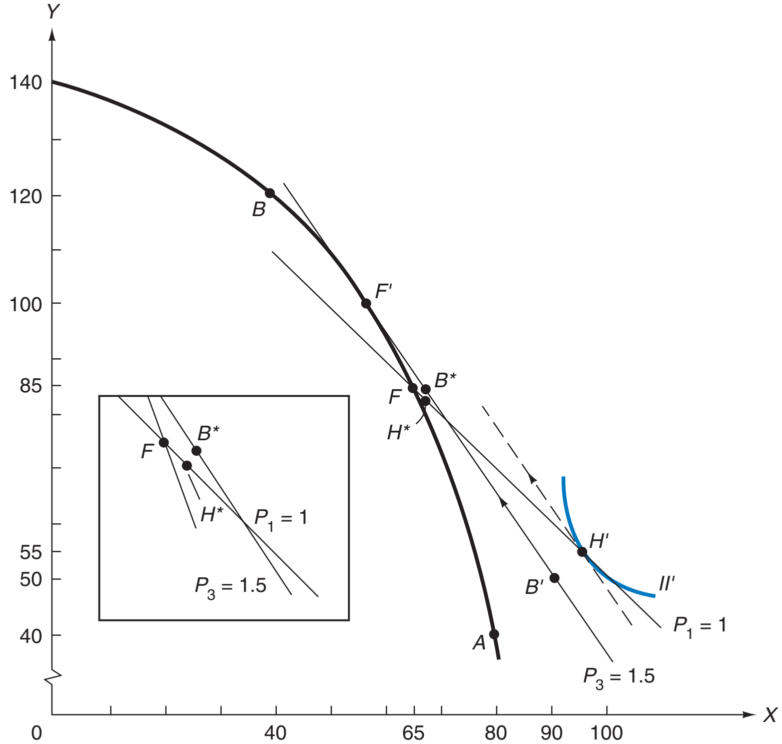

FIGURE 10.3. General Equilibrium Analysis of a Trade-Diverting Customs Union.
With a 100 percent nondiscriminatory import tariff on commodity X, Nation 2 produces at point *F* and consumes at point *H′* on indifference curve *II′* at the relative commodity price of $P_1 = 1$ (exactly as in Figure 8.5). By forming a customs union with Nation 3 only, Nation 2 produces at point *F′* at $P_3 = 1.5$ and consumes at $B' < H'$. This trade-diverting customs union leads to a net welfare loss for Nation 2. However, with different tastes, Nation 2 could conceivably consume at point H^* before and at point B^* after the formation of the customs union with Nation 3 and receive a net welfare gain (since $B^* > H^*$).

consumption of both more X and more Y than point H^*, the trade-diverting customs union would lead to a net welfare *gain* for Nation 2. (For greater clarity, the area of the graph showing the relationship between points F, B^*, and H^* is enlarged in the inset inside the transformation curve.) Thus, a trade-diverting customs union may lead to a net welfare gain or loss, depending on the circumstances under which it is formed.

Problem Starting from Figure 10.3, where Nation 2 produces at point F and consumes at point H', prove graphically that the smaller the relative inefficiency of Nation 3 is with respect to Nation 1, the more likely it is that the formation of a customs union between Nation 2 and Nation 3 will lead to a net welfare gain for Nation 2 (even though the customs union would be trade diverting).

A10.2 Regional Trade Agreements Around the World

Table 10.6 shows the world's trade agreements in 2012.

TABLE 10.6. Regional Trade Agreements around the World in 2012

Africa & Middle East		
Arab Maghreb Union	AMU	Algeria, Libya, Mauritania, Morocco, Tunisia
Common Market for Eastern and Southern Africa	COMESA	Burundi, Comoros, Democratic Republic of Congo, Djibouti, Egypt, Eritrea, Ethiopia, Kenya, Libya, Madagascar, Malawi, Mauritius, Rwanda, Seychelles, Sudan, Swaziland, Uganda, Zambia, Zimbabwe
East-African Community	EAC	Kenya, Tanzania, Uganda
Economic and Monetary Community of Central Africa	CEMAC	Cameroon, Central African Republic, Chad, Congo, Equatorial Guinea, Gabon
Economic Community of Central African States	ECCAS	Angola, Burundi, Cameroon, Central African Republic, Chad, Democratic Republic of Congo, Equatorial Guinea, Gabon, Rwanda, São Tomé and Principe
Economic Community of West African States	ECOWAS	Benin, Burkina Faso, Cape Verde, Côte d'Ivoire, Gambia, Ghana, Guinea, Guinea-Bissau, Liberia, Mali, Niger, Nigeria, Senegal, Sierra Leone, Togo
Gulf Cooperation Council	GCC	Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, United Arab Emirates
Pan-Arab Free Trade Area	PAFTA	Bahrain, Egypt, Iraq, Jordan, Kuwait, Lebanon, Libya, Morocco, Oman, Qatar, Saudi Arabia, Sudan, Syrian Arab Republic, Tunisia
Southern African Development Agreement	SADC	Angola, Botswana, Democratic Republic of Congo, Lesotho, Madagascar, Malawi, Mauritius, Mozambique, Namibia, South Africa, Swaziland, Tanzania, Zambia, Zimbabwe
West-African Economic and Monetary Union	WAEMU	Benin, Burkina, Faso, Côte d'Ivoire, Guinea-Bissau, Mali, Niger, Senegal, Togo
Americas & Caribbean		
Andean Community	CAN	Bolivia, Columbia, Ecuador, Peru
Caribbean Community and Market	CARICOM	Antigua & Barbuda, Bahamas, Barbados, Belize, Dominica, Grenada, Guyana, Haiti, Jamaica, Montserrat, St. Kitts & Nevis, St. Lucia, St. Vincent & the Grenadines, Surinam, Trinidad & Tobago
Central American Common Market	CACM	Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua
Central American Free Trade Agreement	CAFTA	Costa Rica, El Salvador, Guatemala, Honduras, and Nicaragua; with the United States and the Dominican Republic, there is US-DR-CAFTA
Free Trade Agreement of the Americas	FTAA	34 countries of the American Continent (in negotiation)
Latin American Integration Association	LAIA	Argentina, Bolivia, Brazil, Chile, Colombia, Cuba, Ecuador, Ecuador, Mexico, Paraguay, Peru, Uruguay, Venezuela
North American Free Trade Agreement	NAFTA	Canada, Mexico, United States
Southern Common Market	MERCOSUR	Argentina, Brazil, Paraguay, Uruguay
Asia & Pacific		
Asia-Pacific Economic Cooperation	APEC	Australia, Brunei Darussalam, Canada, Chile, China, Hong Kong (China), Indonesia, Japan, Korea, Malaysia, Mexico, New Zealand, Papua New Guinea, Peru, Philippines, Russian Federation, Singapore, Taiwan (China), Thailand, United States, Vietnam

(continued)

TABLE 10.7. *(continued)*

Asia Pacific Trade Agreement	APTA	Bangladesh, China, India, Republic of Korea, Laos, Sri Lanka
Association of South East Asian Nations	ASEAN	Brunei Darussalam, Cambodia, Indonesia, Laos, Malaysia, Myanmar, Philippines, Singapore, Thailand, Vietnam
Economic Cooperation Organization	ECO	Afghanistan, Azerbaijan, Iran, Kazakhstan, Kyrgyz Republic, Pakistan, Tajikistan, Turkey, Turkmenistan, Uzbekistan
South Asian Preferential Trade Agreement	SAFTA	Afganistan, Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan, Sri Lanka
South Pacific Regional Trade and Economic Cooperation	SPARTECA	Australia, New Zealand, Cook Islands, Fiji, Kiribati, Marshall Islands, Micronesia, Nauru, Niue, Papua New Guinea, Solomon Islands, Tonga, Tuvalu, Vanuatu, Western Samoa
Trans-Pacific Strategic Economic Partnership	TPP	Australia, Brunei, Chile, Malaysia, New Zealand, Peru, Singapore, United States, Vietnam
Europe		
Commonwealth of Independent States	CIS	Azerbaijan, Armenia, Belarus, Georgia, Moldova, Kazakhstan, Russian Federation, Ukraine, Uzbekistan, Tajikistan, Kyrgyz Republic
Eurasian Economic Community	EAEC	Belarus, Kazakhstan, Kyrgyz Republic, Russian Federation, Tajikistan
European Union (27)	EU	Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Poland, Portugal, Romania, Slovak Republic, Slovenia, Spain, Sweden, United Kingdom
European Economic Area	EEA	European Union, Iceland, Liechtenstein, Norway
European Free Trade Association	EFTA	Iceland, Liechtenstein, Norway, Switzerland

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For NAFTA's impact on the United States, Canada, Mexico, and other nations, see:

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Information on the Free Trade Area of the Americas (FTAA) is found at:

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For the Asia-Pacific Economic Cooperation (APEC), a regional organization that promotes free trade and economic cooperation among 21 countries, see:

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Information on the ten-member Association of Southeast Asian Nations (ASEAN) is found at:

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Information on international trade, economic restructuring, and regional trade agreement in former communist countries is found at:

http://www.ebrd.com/pages/homepage.shtml

International Trade and Economic Development

chapter 11

LEARNING GOALS:

After reading this chapter, you should be able to:

- Understand the relationship between international trade and economic development
- Understand the relationship between the terms of trade and export instability and economic development
- Compare imports substitution with export orientation as a development strategy
- Describe the current problems facing developing countries

11.1 Introduction

With the exception of a handful of nations in North America, Western Europe, Japan, Australia, and New Zealand, most nations of the world are classified as less developed or, to put it more positively, as developing countries. In relation to developed (or more developed) countries, developing nations are characterized in general by low (and sometimes extremely low) average real per capita income, a high proportion of the labor force in agriculture and other primary activities such as mineral extraction, low life expectancies, high rates of illiteracy, high rates of population growth, and low rates of growth in average real per capita income. There is, however, no sharp dichotomy between developed and developing nations but a fairly continuous spectrum from the very rich to the very poor.

In the past, the economic relationship between the developed and developing nations was characterized by developing nations exporting primarily food and raw materials in exchange for manufactured goods from developed nations. This is still the case for the poorest developing nations, but not for the more advanced ones. In 1980, manufactured products were only 25 percent of developing country exports; by 2010, that figure exceeded 80 percent (UNCTAD, 2011).

Although the level and rate of economic development depend primarily on internal conditions in developing nations, most economists today believe that international trade can contribute significantly to the development process. This was not always the case. Until the 1980s, a sizable and influential minority of economists strongly believed that international trade and the functioning of the present international economic system hindered rather than facilitated development through secularly declining terms of trade and widely fluctuating export earnings for developing nations. These economists contended that standard international trade theory based on comparative advantage was completely irrelevant for developing nations and the development process. Therefore, they advocated industrialization through import substitution (i.e., the domestic production of manufactured goods previously imported) and generally placing less reliance on international trade by developing nations. They also advocated reform of the present international economic system to make it more responsive to the special needs of developing countries.

In this chapter, we examine all of these topics. The presentation will necessarily be brief, since these issues are discussed in detail in courses and textbooks in development economics. In Section 11.2, we examine the relationship between international trade and economic development in general. In Section 11.3, we discuss the terms of trade and their effect on economic development, and we do the same for export instability in Section 11.4. Section 11.5 then focuses on the policy of development through import substitution or through exports. Finally, in Section 11.6, we examine the major problems facing developing countries today.

11.2 The Importance of Trade to Development

In this section, we first analyze the claim that international trade theory is irrelevant for developing nations and to the development process. Then we examine the ways in which international trade operated as an "engine of growth" for the so-called regions of recent settlement in the nineteenth century and the reasons it can no longer be relied on to the same extent by today's developing nations. We will complete this section on a positive note by examining all of the important ways in which international trade can still contribute to the process of economic development today.

11.2A Trade Theory and Economic Development

According to traditional trade theory, if each nation specializes in the production of the commodity of its comparative advantage, world output will be greater and, through trade, each nation will share in the gain. With the present distribution of factor endowments and technology between developed and developing nations, the theory of comparative advantage thus prescribes that developing nations should continue to specialize primarily in the production of and export of raw materials, fuels, minerals, and food to developed nations in exchange for manufactured products.

While this may maximize welfare in the short run, developing nations believe that this pattern of specialization and trade relegates them to a subordinate position vis-à-vis developed nations and keeps them from reaping the *dynamic* benefits of industry and maximizing their welfare in the long run. The dynamic benefits (to be distinguished from the static benefits from comparative advantage) resulting from industrial production are a more trained labor force, more innovations, higher and more stable prices for the nation's exports, and higher income for its people. With developing nations specializing in primary commodities and developed nations specializing in manufactured products, all or most of these dynamic benefits of industry and trade accrue to developed nations, leaving developing nations poor, undeveloped, and dependent. This belief is reinforced by the observation that all developed nations are primarily industrial, whereas most developing nations are, for the most part, primarily agricultural or engaged in mineral extraction or the production of simple manufactured goods.

Thus, traditional trade theory was attacked for being static and irrelevant to the development process. According to this thesis, traditional trade theory involves adjustment to existing conditions, whereas development necessarily requires changing existing conditions. In short, traditional trade theory was believed to maximize welfare at one point in time or in the short run but not over time or in the long run.

These are serious charges, which, if true, would indeed make traditional trade theory irrelevant to the process of economic development. However, as shown in Chapter 7 (that dealt with economic growth and international trade), traditional trade theory can readily be extended to incorporate changes in factor supplies and technology over time. What this means is that a nation's pattern of development is not determined once and for all, but must be recomputed as underlying conditions change or are expected to change over time in the nation. For example, as a developing nation accumulates capital and improves its technology, its comparative advantage shifts away from primary products and simple manufactured goods to more sophisticated goods and services. To some extent, this has already occurred in Brazil, Korea, Taiwan, Mexico, and many other developing nations. As a result, traditional trade theory remains very much relevant to developing nations and the development process.

Furthermore, the dynamic benefits from industry can theoretically be incorporated into the original calculations of comparative advantage and into subsequent changes in comparative advantage over time. This may indicate that the expansion of industrial production does not always represent the best use of the developing nation's scarce resources—as some of these nations have now come to realize. Thus, although the need for a truly dynamic theory cannot be denied, comparative statics can carry us a long way toward incorporating dynamic changes in the economy into traditional trade theory. As a result, traditional trade theory, with the qualifications as noted, is of relevance even for developing nations and the development process. At least this is the feeling of most economists who have studied the problem.

11.2B Trade as an Engine of Growth

During the nineteenth century, most of the world's modern industrial production was concentrated in Great Britain. Large increases in industrial production and population in resource-poor Britain led to a rapidly rising demand for the food and raw material exports of the regions of recent settlement (the United States, Canada, Australia, New Zealand, Argentina, Uruguay, and South Africa). For example, during the century from 1815 to 1913, Britain's population tripled, its real GNP increased 10 times, and the volume of its imports increased 20 times. The stimulus provided by their rapidly expanding exports then spread to the rest of the economy of these newly settled lands through the familiar accelerator-multiplier process. Thus, according to *Nurkse* (1970), the export sector was the leading sector that propelled these economies into rapid growth and development. That is, international trade functioned as an engine of growth for these nations during the nineteenth century.

The regions of recent settlement were able to satisfy Britain's burgeoning demand for food and raw materials (and in the process grow very rapidly) because of several favorable circumstances. First, these countries were richly endowed with natural resources such as fertile arable land, forests, and mineral deposits. Second, workers with various skills moved in great waves from overpopulated Europe to these mostly empty lands, and so did huge amounts of capital. Although data are far from precise, it seems that from 30 to 50 percent of total capital formation (i.e., investments) in such nations as Canada, Argentina, and Australia was financed through capital inflows. The huge inflows of capital and workers made possible the construction of railroads, canals, and other facilities that allowed the opening up of new supply sources of food and raw materials. Finally, the great improvement in sea transportation enabled these new lands to satisfy the rising demand for wheat, corn, cotton, wool, leather, and a variety of other foods and raw materials more cheaply than traditional sources of supply in Europe and elsewhere.

Thus, all "ingredients" were present for rapid growth in these new lands: The demand for their products was rising rapidly; they had great and unexploited natural resources; and they received huge amounts of capital and millions of workers from Europe. To be sure, there are some economists, notably *Kravis*, who believe (and have presented data that seem to show) that the rapid growth of the regions of recent settlement during the nineteenth century was due primarily to very favorable internal conditions (such as abundant natural resources), with trade playing only an important *supportive* role. Be that as it may, it is generally agreed that today's developing nations can rely much less on trade for their growth and development. This is due to less favorable demand and supply conditions.

On the demand side, it is pointed out that the demand for food and raw materials is growing much less rapidly today than was the case for the regions of recent settlement during the nineteenth century. There are several reasons for this: (1) The income elasticity of demand in developed nations for many of the food and agricultural raw material exports of developing nations is less (and sometimes much less) than 1, so that as income rises in developed nations, their demand for the agricultural exports of developing nations increases proportionately less than the increase in income. For example, the income elasticity of demand for coffee is about 0.8, for cocoa 0.5, for sugar 0.4, and for tea 0.1. (2) The development of synthetic substitutes has reduced the demand for natural raw materials; for example, synthetic rubber has reduced the demand for natural rubber, nylon the demand for cotton, and plastics the demand for hides and skins. (3) Technological advances have reduced the raw material content of many products, such as tin-plated cans and microcircuits. (4) The output of services (with lower raw material requirements than commodities) has grown faster than the output of commodities in developed nations. (5) Developed nations have imposed trade restrictions on many temperate exports (such as wheat, vegetables, sugar, oils, and other products) of developing nations.

On the supply side, *Cairncross* (1962) has pointed out that most of today's developing nations are much less well endowed with natural resources (except for petroleum-exporting nations) than were the regions of recent settlement during the nineteenth century. In addition, most of today's developing nations are over-populated, so that most of any increase in their output of food and raw materials is absorbed domestically rather than exported. Furthermore, the international flow of capital to most developing nations today is relatively much less than it was for the regions of recent settlement in the nineteenth century, and today's developing nations seem also to face an outflow of skilled labor rather than an inflow. (These topics are discussed in Chapter 12.) Finally, it is also true that until the 1990s, developing nations have somewhat neglected their agriculture in favor of more rapid industrialization, thereby hampering their export (and development) prospects.

11.2c The Contributions of Trade to Development

Even though international trade cannot in general be expected to be an "engine of growth" today, there are still many ways (besides the static gains from comparative advantage) in which it can contribute to the economic growth of today's developing nations. *Haberler*, among others, has pointed out the following important beneficial effects that international trade can have on economic development: (1) Trade can lead to the full utilization of otherwise underemployed domestic resources. That is, through trade, a developing nation can move from an inefficient production point inside its production frontier, with unutilized resources because of insufficient internal demand, to a point on its production frontier with trade. For such a nation, trade would represent a vent for surplus, or an outlet for its potential surplus of agricultural commodities and raw materials. This has indeed occurred in many developing nations, particularly those in Southeast Asia and West Africa.

In addition, (2) by expanding the size of the market, trade makes possible division of labor and economies of scale. This is especially important in the production of light manufactures in small economies in the early stages of development. (3) International trade is the vehicle for the transmission of new ideas, new technology, and new managerial and other skills. (4) Trade also stimulates and facilitates the international flow of capital from developed to developing nations. In the case of foreign direct investments, where the foreign firm retains managerial control over its investment, the foreign capital is likely to be accompanied by foreign skilled personnel to operate it. (5) In several large developing nations, such as Brazil and India, the importation of new manufactured products stimulated domestic demand until efficient domestic production of these goods became feasible. Finally, (6) international trade is an excellent antimonopoly weapon because it stimulates greater efficiency by domestic producers to meet foreign competition. This is particularly important to keep low the cost and price of intermediate or semifinished products used as inputs in the domestic production of other commodities.

Critics of international trade can match this impressive list of benefits with an equally impressive list of the allegedly harmful effects of trade. However, since a developing nation can refuse to trade if it gains nothing or loses, the presumption is that it must also gain from trade. It is true that when most of the gains from trade accrue to developed nations, there is a great deal of dissatisfaction and justification for demands to rectify the situation, but this should not be construed to mean that trade is actually harmful. One can, of course, always find cases where, on balance, international trade may actually have hampered economic development. However, in most cases it can be expected to provide invaluable assistance to the development process. This has been confirmed empirically by many researchers (see Selected Bibliography at the end of the chapter). China, which for security and ideological reasons strove for self-sufficiency during most of the postwar period, during the 1990s came to appreciate the potential contribution of trade to its growth and development and is indeed now reaping major benefits from international trade—as are the former communist countries of Eastern Europe after the fall of communism.

11.2D International Trade and Endogenous Growth Theory

Recent developments in endogenous growth theory starting with *Romer* (1986) and *Lucas* (1988) provide a more convincing and rigorous theoretical basis for the positive relationship between international trade and long-run economic growth and development. Specifically, the new theory of endogenous economic growth postulates that lowering trade barriers will speed up the rate of economic growth and development in the long run by (1) allowing developing nations to absorb the technology developed in advanced nations at a faster rate than with a lower degree of openness, (2) increasing the benefits that flow from research and development (R&D), (3) promoting larger economies of scale in production, (4) reducing price distortions and leading to a more efficient use of domestic resources across sectors, (5) encouraging greater specialization and more efficiency in the production of intermediate inputs, and (6) leading to the more rapid introduction of new products and services.

To be sure, many of these ways by which freer trade can stimulate growth and development had been recognized earlier (see Section 11.2C). Previous theorizing, however, was much more casual and less rigorous. The new endogenous growth theory probes deeper and seeks to spell out more rigorously and in greater detail the actual channels or the ways by which lower trade barriers can stimulate growth in the long run. In particular, endogenous growth theory seeks to explain how *endogenous* technological change creates externalities that offset any propensity to diminishing returns to capital accumulation (as postulated by neoclassical growth theory). Diminishing returns arise when more units of a variable input are used with fixed amounts of other inputs.

In spite of the progress made by the new endogenous growth theory in spelling out theoretically the channels through which freer trade leads to faster economic growth and development in the long run, it has been difficult to test these links explicitly in the real world because of a lack of more detailed data. In fact, as *Edwards* (1993) and *Pack* (1994) point out, most empirical tests to date have been based on broad cross-sectional data for groups of countries and are not very different from the empirical studies conducted earlier. That is, these new empirical studies (see the references in Selected Bibliography) have generally shown that openness leads to faster growth, but they have not been able to actually test in detail the specific channels by which trade is supposed to lead to faster growth in the long run—which is the major theoretical contribution of endogenous growth theory. For this, more specific country studies examining the relationship among innovation, trade, and growth are needed (see Case Study 11-1).

CASE STUDY 11-1 The East Asian Miracle of Growth and Trade

Table 11.1 shows the average growth rate of real GDP and trade in the High-Performance Asian Economies (HPAEs). These include Hong Kong, Korea, Singapore, and Taiwan (the so-called four "tigers," which started rapid growth in the 1960s), as well as Malaysia, Indonesia, Thailand, and especially China, which followed them in the high-growth path in the 1970s and 1980s. Because of its spectacular growth, China is a class by itself. Data on Taiwan (Chinese Taipei) were not available.

The table shows that real GDP grew at the average rate of 6.9 percent in the HPAEs during the 1980–1990 decade and 7.7 percent in the 1990–1995 period. The growth of real GDP in China was even greater—10.2 percent and 12.8 percent, respectively. At these rates, the growth of real GDP would double every ten years or so in the HPAEs and every six or seven years in China.

Table 11.1 also shows that the rate of growth of exports was even greater than the growth of GDP. The growth of exports is certain to have provided a great stimulus to the growth of GDP and in turn to have been stimulated by it. There were, of course, other forces at work that contributed to the extraordinary growth of HPAEs and China. These were extremely high rates of savings and investments, significant improvement in education and training, the rapid rate of adoption of new technologies, and the shift from agrarian to industrial economies. This "East Asian miracle" of growth and trade has to be compared with much lower average growth rates of real GDP and exports for all developing countries and for industrial countries (see Table 11.1).

In July 1997, however, Thailand suddenly plunged into a deep economic crisis that quickly spread to the other HPAEs (with the exception of China, which had maintained a tight control over its economy). The cause of the crisis was excessive borrowing of short-term funds in dollars and yen on international capital markets and using a great deal of these funds for real estate speculation and other unproductive investments. When local banks and firms were unable to repay their loans, foreign banks refused to extend new loans. Local banks then stopped making loans to local businesses, causing many of them to fail and plunging the nations into deep recession. At the height of the crisis in 1997–1998, the real GDP of Korea, Hong Kong, Thailand, and Malaysia declined by more than 5 percent and by nearly 15 percent in Indonesia. By 1998–1999, however, the worst of the crisis was over and growth had resumed, but at lower than the precrisis levels (except for China).

TABLE 11.1. Average Growth of Real GDP and Trade in HPAEs, 1980–1995 (Percentages)

	Growth of Real GDP		Growth of Exports	
	1980–1990	1990–1995	1980–1990	1990–1995
Korea	9.4%	7.2%	12.0%	13.4%
Hong Kong	6.9	5.6	14.4	13.5
Singapore	6.4	8.7	10.0	13.3
Thailand	7.6	8.4	14.0	14.2
Indonesia	6.1	7.6	5.3	21.3
Malaysia	5.2	8.7	10.9	14.4
Average	6.9	7.7	11.1	15.0
China	10.2	12.8	11.5	15.6
Developing countries	2.8	2.1	7.3	5.2
Industrial countries	3.2	2.0	5.2	6.4

Source: World Bank, *World Bank Development Report*, 1997–2009.

11.3 The Terms of Trade and Economic Development

In this section, we first define the various terms of trade. We then analyze the alleged reasons for expecting the commodity terms of trade of developing nations to deteriorate. Finally, we present the results of some empirical studies that have attempted to measure the change in developing nations' commodity and income terms of trade over time.

11.3A The Various Terms of Trade

In Section 4.6, we defined the commodity, or net barter, terms of trade. However, there are several other types of terms of trade, notably, the income terms of trade, the single factoral terms of trade, and the double factoral terms of trade. We will define each of these terms of trade, give an example of each, and explain their significance.

In Section 4.6, we defined the commodity, or net barter, terms of trade (N) as the ratio of the price index of the nation's exports (P_X) to the price index of its imports (P_M) multiplied by 100 (to express the terms of trade in percentages). That is:

$$N = (P_X/P_M)\ 100 \tag{11-1}$$

For example, if we take 1980 as the base year ($N = 100$), and we find that by the end of 2010 the nation's P_X fell by 5 percent (to 95), while its P_M rose by 10 percent (to 110), then this nation's commodity terms of trade declined to

$$N = (95/100)100 = 86.36$$

This means that between 1980 and 2010 the nation's export prices fell by 14 percent in relation to its import prices.

A nation's income terms of trade (I) are given by

$$I = (P_X/P_M)\ Q_X \tag{11-2}$$

where Q_X is an index of the *volume* of exports. Thus, I measures the nation's export-based capacity to import. Returning to our example, if Q_X rose from 100 in 1980 to 120 in 2010, then the nation's income terms of trade rose to

$$I = (95/100)120 = (0.8636)(120) = 103.63$$

This means that from 1980 to 2010 the nation's capacity to import (based on its export earnings) increased by 3.63 percent (even though P_X/P_M declined). The change in the income terms of trade is very important for developing nations, since they rely to a large extent on imported capital goods for their development.

A nation's single factoral terms of trade (S) are given by

$$S = (P_X/P_M)\ Z_X \tag{11-3}$$

where Z_X is a *productivity* index in the nation's export sector. Thus, S measures the amount of imports the nation gets per unit of domestic factors of production embodied in its exports. For example, if productivity in the nation's export sector rose from 100 in 1980 to 130 in 2010, then the nation's single factoral terms of trade increased to

$$S = (95/110)130 = (0.8636)(130) = 112.27$$

This means that in 2010 the nation received 12.27 percent more imports per unit of domestic factors embodied in its exports than it did in 1980. Even though the nation shares part of its productivity increase in its export sector with other nations, the nation is better off in 2010 than it was in 1980 (by more than indicated by the increase in I and even though N declined).

The concept of the single factoral terms of trade can be extended to measure the nation's double factoral terms of trade (D), given by

$$D = (P_X/P_M)(Z_X/Z_M)\ 100 \tag{11-4}$$

where Z_M is an *import* productivity index. Thus, D measures how many units of domestic factors embodied in the nation's exports are exchanged per unit of *foreign* factors embodied in its imports. For example, if Z_M rises from 100 to 105 between 1980 and 2010, then D rises to

$$D = (95/100)(130/105) = (0.8636)(1.2381)(100) = 106.92$$

Of the four terms of trade defined, N, I, and S are the most important. D does not have much significance for developing nations and is very seldom, if ever, measured. (It was included here only for the sake of completeness.) The most significant terms of trade for developing nations are I and S. However, since N is the easiest to measure, most of the discussion in the economic literature has been in terms of N. Indeed, N is often referred to simply as "the terms of trade." As we have seen in the above examples, I and S can rise even when N declines. This is generally regarded as favorable to a developing nation. Of course, the most favorable situation is when N, I, and S all increase. On the other hand, the worst possible situation from the point of view of a developing nation occurs when all three terms of trade deteriorate. This may lead to *immiserizing growth*, discussed in Section 7.5B.

11.3B Alleged Reasons for Deterioration in the Commodity Terms of Trade

According to such economists as *Prebisch, Singer*, and *Myrdal*, the *commodity terms of trade* of developing nations tend to deteriorate over time. The reason is that most or all of the productivity increases that take place in developed nations are passed on to their workers in the form of higher wages and income, while most or all of the productivity increases that take place in developing nations are reflected in lower prices. Thus, developed nations, so the argument goes, have the best of both worlds. They retain the benefits of their own productivity increases in the form of higher wages and income for their workers, and at the same time they also reap most of the benefits from the productivity increases taking place in developing nations through the lower prices that they are able to pay for the agricultural exports of developing nations.

The very different response to productivity increases in developed and developing nations is due to the widely differing conditions in their internal labor markets. Specifically, because labor is relatively scarce in developed nations and labor unions are strong, most of the productivity increases in developed nations are extracted by labor in the form of higher wages, leaving costs of production and prices more or less unchanged. Indeed, labor in these nations was often able to extract wage increases that are even higher than their productivity increases. This raised costs of production and the prices of the manufactured goods that developed nations export. On the other hand, because of surplus labor, large unemployment, and weak or nonexistent labor unions in most developing nations, all or most of the increases in productivity taking place in these nations are reflected in lower production costs and in lower prices for their agricultural exports.

If all productivity increases were reflected in lower commodity prices in both developed and developing nations, the terms of trade of developing nations should have improved over time. The reason is that productivity increases in agriculture are generally smaller than in industry. Therefore, the cost and prices of manufactured goods should fall in relation to the prices of agricultural commodities. Since developed nations export mostly manufactured goods and import mostly agricultural commodities and raw materials, their terms of trade should deteriorate, so that the terms of trade of developing nations (the inverse, or reciprocal) should improve over time. It is because productivity increases are reflected in higher wages in developed countries but in lower prices in developing countries that, according to *Prebisch* (1962), *Singer* (1950), and *Myrdal* (1959), we can expect a secular deterioration in the collective terms of trade of developing nations.

Another reason for expecting the terms of trade of developing nations to deteriorate is that their demand for the manufactured exports of developed nations tends to grow much faster than the latter's demand for the agricultural and raw material exports of developing nations. This is due to the much higher income elasticity of demand for manufactured goods than for agricultural commodities and raw materials. While these arguments seem to make some sense, it is difficult to evaluate them on theoretical grounds alone. Furthermore, the fact that many developing nations have experienced a large increase in the share of manufactured exports in their total exports during the past decades makes the calculations much more difficult and the results obtained less useful.

11.3c Historical Movement in the Commodity and Income Terms of Trade

Prebisch and Singer based their belief that the (commodity) terms of trade of developing nations tend to deteriorate on a 1949 United Nations study that showed that the terms of trade of the United Kingdom rose from 100 in 1870 to 170 in 1938. Since the United Kingdom exported manufactured goods and imported food and raw materials while developing nations exported food and raw materials and imported manufactured goods, Prebisch and Singer inferred from this that the terms of trade of developing nations (the inverse of the terms of trade of the United Kingdom) had fallen from 100 to $100/170 = 59$.

This conclusion was seriously challenged on several grounds. First of all, since the prices of exports and imports were measured at dockside in the United Kingdom, a great deal of the observed relative decline in the price of food and raw material imports of the United Kingdom reflected the sharp decline in the cost of ocean transportation that occurred over this period and not lower relative prices received by exporting nations. Second, the higher relative prices received by the United Kingdom for its manufactured exports reflected the greater quality improvements in manufactured goods than in primary commodities. For example, a typewriter or PC today does many more things automatically than a typewriter of 20 or 30 years ago, whereas a pound of coffee today is not much different from a pound of coffee of previous years. Therefore, it is only natural that the price of some manufactured goods should rise in relation to the price of primary commodities. Third, developed nations also exported some primary commodities (witness the large agricultural exports of the United States), and developing nations also exported many manufactured goods. Consequently, measuring the terms of trade of developing nations as the price of traded primary commodities divided by the price of traded manufactured goods is not entirely valid. Fourth, the study ended in a depression year when prices of primary commodities were abnormally low, so that the increase in the terms of trade of the United Kingdom (and therefore the decline in the terms of trade of developing nations) was greatly overestimated.

Such criticisms stimulated other empirical studies that attempted to overcome the shortcomings of the United Nations study. One of these is the study published in 1956 by *Kindleberger*, in which he concluded that the terms of trade of developing nations vis-à-vis Western Europe declined only slightly from 1870 to 1952. However, he also could not take quality changes into account. A 1963 study by *Lipsey* found that the terms of trade of developing nations in relation to those of the United States did not suffer any continuous downward trend from 1880 to 1960. They rose before World War I and from World War II to 1952 and declined after that. More recently, *Spraos* (1983) confirmed that the commodity terms of trade of developing nations had deteriorated from 1870 to 1938, but by much less than was found in the United Nations study, after correcting for transportation costs and quality changes. By including the postwar period until 1970, however, Spraos found no evidence of deterioration. *Grilli and Yang* (1988) found that the terms of trade *between primary products and manufactures* (the approximate terms of trade of developing nations at the time) declined by about 0.6 percent per year over the 1900–1986 period and since 1953 when petroleum products were excluded. These results are confirmed by *Reinhart and Wickham* (1994) for the 1900–1990 period. *Cashin and McDermott* (2002) showed that real commodity prices deteriorated by about 1 percent per year over the 140-year period from 1862 to 1999. They also found evidence of rising amplitude of price fluctuations since the early 1900s and more frequent fluctuations since the early 1970s. These results were confirmed by *Harvey et al.* (2010). Finally, *Zanias* (2004) showed with Figure 11.1 that the price of primary commodities with respect to the price of manufactured goods (measured

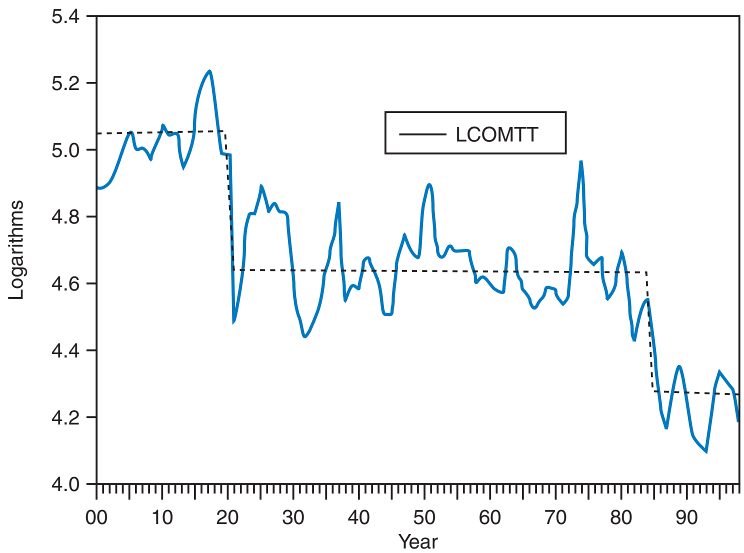

FIGURE 11.1. Commodity Terms of Trade and Structural Breaks, 1900–1998.

along the vertical axis in logarithms, so that equal distances refer to equal percentages) dropped to nearly one-third from 1900 to 1998, but that this occurred during structural breaks (1915–1920 and 1975–1993) rather than gradually over time.

Several important conclusions emerge from these studies. First, estimating the change in the secular terms of trade inevitably faces serious statistical difficulties. For example, results are very sensitive to which years are taken as the beginning and the end of the data series and the way the price indices of exports and imports are calculated. Second, the movement in the overall terms of trade of all developing nations does not have much relevance for individual developing nations. For example, a developing nation that exported food experienced terms of trade that increased much less than one that exported primarily petroleum trade. Thus, what is important is the type of products that each developing nation exports and the change in the price of those products over time (see Case Study 11-2). Third, most studies found that, regardless of the secular movement in the *commodity terms of trade*, the overall *income terms of trade* of developing nations as a group have increased substantially over time because of sharply rising volumes of exports. For example, *Grilli and Yang* (1988) found that between 1953 and 1983 the commodity terms of trade of developing nations declined by about 20 percent, but their income terms of trade increased by about 165 percent (and as pointed out earlier, the income terms of trade are more important than the commodity terms of trade for developing nations). Finally, attempts to measure the factoral terms of trade have been seriously hampered by the difficulty of obtaining measures of productivity changes.

CASE STUDY 11-2 Change in Commodity Prices over Time

Table 11.2 shows the change in commodity price indices in selected years from 1972 to 2011. Setting the price in 2000 equal to 100, the table shows that the price of nonfuel commodities rose from 44 in 1972 to 238 in 2011, or by 138 percent (note that percentage changes are calculated by using the average of the initial and ending prices). Over the same 1972–2011 period, food prices rose by 115 percent, beverages by 128 percent, raw materials by 141 percent, and metals by 160 percent, as compared with 188 percent for petroleum. Note, however, that the price indices shown in Table 11.2 fluctuate a great deal over time and that we should get very different results if we compared any other set of years. The data also imply that the terms of trade of primary exporters depend very much on the commodity they export. (See Table 4.3 in Case Study 4-4 for the change in terms of trade of advanced countries, of developing countries as a whole, and of Asia, the Middle East, and the Western Hemisphere.)

TABLE 11.2. Changes in Commodities Prices, Selected Years, 1972–2011 (2000 = 100)

Commodity	1972	1974	1980	1986	1990	1995	2000	2005	2010	2011	% Change 1972–2010
Nonfuel commodities	44	85	114	85	106	125	100	126	202	238	138
Food	59	133	139	90	113	127	100	122	182	218	115
Beverages	60	92	191	195	102	154	100	132	233	272	128
Raw materials	27	44	80	64	94	124	100	102	127	156	141
Metals	43	79	110	79	122	122	100	160	323	366	160
Petroleum	10	41	130	50	82	61	100	189	276	314	188

Source: International Monetary Fund, *International Financial Statistics*, (Washington, D.C.: IMF, various issues).

11.4 Export Instability and Economic Development

Independently of deteriorating long-run or secular terms of trade, developing nations may also face large *short-run fluctuations* in their export prices and earnings that could seriously hamper their development. In this section, we concentrate on this short-run instability. We first analyze from a theoretical point of view the causes and effects of short-run fluctuations in the export prices and earnings of developing nations. Then we present the results of some empirical studies that have attempted to measure the magnitude of these short-run fluctuations and their actual effect on development. Finally, we discuss briefly international commodity agreements directed at stabilizing and increasing the export prices and earnings of developing nations.

11.4A Cause and Effects of Export Instability

Developing nations often experience wild fluctuations in the prices of their primary exports. This is due to both inelastic and unstable demand and supply. In Figure 11.2, D and S represent, respectively, the steeply inclined (inelastic) hypothetical demand and supply curves of developing nations' primary exports. With D and S, the equilibrium price is P. If for whatever reason D decreases (shifts to the left) to D' or S increases (shifts to the right) to S', the equilibrium price falls sharply to P'. If both D and S shift at the same time to D' and S', the equilibrium price falls even more, to P''. If then D' and S' shift back to D and S, the equilibrium price rises very sharply and returns to P. Thus, inelastic (i.e., steeply inclined) and unstable (i.e., shifting) demand and supply curves for the primary exports of developing countries can lead to wild fluctuations in the prices that these nations receive for their exports.

But why should the demand and supply curves of the primary exports of developing nations be inelastic and shifting? The demand for many primary exports of developing nations is price inelastic because individual households in developed nations spend only

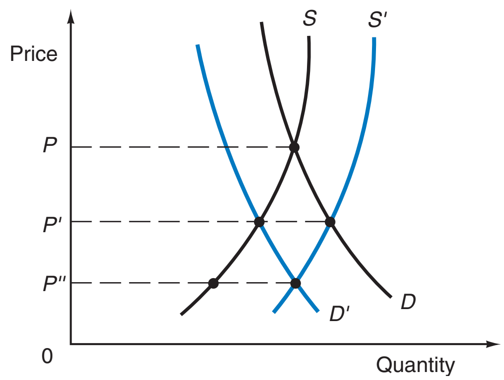

FIGURE 11.2. Price Instability and the Primary Exports of Developing Nations.
D and S refer, respectively, to the demand and supply curves of the primary exports of developing nations. With D and S, the equilibrium price is P. If D shifts to D' or S to S', the equilibrium price falls sharply to P'. If both D and S shift to D' and S', the equilibrium price falls even more, to P''. If, subsequently, D' and S' shift back up to D and S, the equilibrium price moves back up to P. Thus, price inelastic and unstable D and S curves may lead to wild price fluctuations.

a small proportion of their income on such commodities as coffee, tea, cocoa, and sugar. Consequently, when the prices of these commodities change, households do not significantly change their purchases of these commodities, resulting in a price-inelastic demand. On the other hand, the demand for many minerals is price inelastic because few substitutes are available. At the same time, the demand for the primary exports of developing nations is unstable because of business cycle fluctuations in developed nations.

Turning to the supply side, we find that the supply of the primary exports of developing nations is price inelastic (i.e., the quantities supplied do not respond very much to changes in their prices) because of internal rigidities and inflexibilities in resource uses in most developing nations, especially in the case of tree crops that involve long gestation periods. Supplies are unstable or shifting because of weather conditions, pests, and so on.

Because of wildly fluctuating export prices, the export *earnings* of developing nations are also expected to vary significantly from year to year. When export earnings rise, exporters increase their consumption expenditures, investments, and bank deposits. The effects of these are magnified and transmitted to the rest of the economy by the familiar multiplier-accelerator process. The subsequent fall in export earnings results in a multiple contraction of national income, savings, and investment. This alternation of boom and bust periods renders development planning (which depends on imported machinery, fuels, and raw materials) much more difficult.

11.4B Measurements of Export Instability and Its Effect on Development

In a well-known study published in 1966, *MacBean* found that over the 1946–1958 period the index of instability of export earnings (defined as the average percentage deviation of the dollar value of export proceeds from a five-year moving average and measured on a scale of 0 to 100) was 23 for a group of 45 developing nations and 18 for a group of 18 developed nations for which data were available.

These empirical results seem to indicate that, while export instability is somewhat larger for developing nations than for developed nations, the degree of instability itself is not very large *in an absolute sense* when measured on a scale of 0 to 100. MacBean also showed that the greater instability of export earnings of developing nations was not due, as previously believed, to the fact that these nations exported only a few commodities or exported these commodities to only a few nations (i.e., to commodity and geographic concentration of trade) but depended primarily on the type of commodities exported. For example, those nations exporting such commodities as rubber, jute, and cocoa faced much more unstable export earnings than developing nations exporting petroleum, bananas, sugar, and tobacco.

MacBean further showed that the greater fluctuation in the export earnings of developing nations did not lead to significant fluctuations in their national incomes, savings, and investments and did not seem to interfere much with their development efforts. This was probably due to the relatively low absolute level of instability and to the fact that very low foreign trade multipliers insulated the economies of developing nations from fluctuations in their export earnings. These results led MacBean to conclude that the very costly international commodity agreements demanded by developing nations to stabilize their export earnings were not justified. The same resources could be used more profitably for truly developmental purposes than to stabilize export earnings, which were not very unstable to begin with. Subsequent studies by *Massell* (1970), *Lancieri* (1978), *Love* (1986), *Massell* (1990), *Ghosh and Ostry* (1994), and *Sinha* (1999) confirm for later periods MacBean's results that export instability was not very large and that it has not hampered development.

11.4C International Commodity Agreements

The stabilization of export prices *for individual producers* in developing nations could be achieved by purely domestic schemes such as the marketing boards set up after World War II. These operated by purchasing the output of domestic producers at the stable prices set by the board, which would then export the commodities at fluctuating world prices. In good years, domestic prices would be set below world prices so that the board could accumulate funds, which it would then disburse in bad years by paying domestic producers higher than world prices. Examples are the cocoa marketing board of Ghana and the rice marketing board of Burma (now Myanmar). However, only a few of these marketing boards met with some degree of success because of the great difficulty in correctly anticipating the domestic prices that would average out world prices over time and because of corruption.

Developing nations, however, were most interested in international commodity agreements because they also offered the possibility of *increasing* their export prices and earnings. There are three basic types of international commodity agreements: buffer stocks, export controls, and purchase contracts.

Buffer stocks involve the purchase of the commodity (to be added to the stock) when the commodity price falls below an agreed minimum price, and the sale of the commodity out of the stock when the commodity price rises above the established maximum price. Buffer stock agreements have certain disadvantages: (1) Some commodities can be stored only at a very high cost; and (2) if the minimum price is set above the equilibrium level, the stock grows larger and larger over time. An example of a buffer stock arrangement is the *International Tin Agreement*. This was set up in 1956, but, after a number of years of successful operation, it collapsed in 1985. The *International Natural Rubber Agreement* was set up in 1979 and was terminated in 1998, while the *International Cocoa Agreement* was set up in 2001 and is still in operation.

Export controls seek to regulate the quantity of a commodity exported by each nation in order to stabilize commodity prices. The main advantage of an export control agreement is that it avoids the cost of maintaining stocks. The main disadvantage is that (as with any quota system) it introduces inefficiencies and requires that all major exporters of the commodity participate (in the face of strong incentives for each of them to remain outside or cheat on the agreement). An example is the *International Sugar Agreement*. This was negotiated in 1954 but has generally been unable to stabilize and raise sugar prices because of the ability of developed nations to increase their own production of beet sugar. The *International Coffee Agreement*, set up in 1962, did succeed in stabilizing coffee prices during the 1980s. This agreement, however, collapsed in 1989 as did coffee prices, but it was revived in 1993. Since the late 1990s, however, coffee prices have collapsed in the face of excessive supplies that the global export retention scheme of the Association of Coffee Producing Countries failed to curtail sufficiently. As pointed out in Section 9.3C, OPEC was in disarray during the 1980s and most of the 1990s as oversupply of petroleum products and contained growth in demand caused large price declines, after the sharp increases of the 1970s. Since the start of the last decade, however, petroleum prices have risen sharply (see Table 11.2).

Purchase contracts are long-term multilateral agreements that stipulate a minimum price at which importing nations agree to purchase a specified quantity of the commodity and a maximum price at which exporting nations agree to sell specified amounts of the commodity. Purchase contracts thus avoid the disadvantages of buffer stocks and export controls but result in a two-price system for the commodity. An example is the *International Wheat Agreement*, which was signed in 1949. This agreement, however, affected primarily the United States, Canada, and Australia rather than developing nations, and it became inoperative when, as a result of the huge wheat purchases by the Soviet Union since the early 1970s, wheat prices rose sharply above the established price ceiling. The agreement was terminated in 1995.

The international commodity agreements mentioned earlier are the only ones of any significance to have been operational at one time or another since World War II. However, as already noted, with the exception of the International Coffee Agreement, they either failed or have had very limited success in stabilizing and increasing the export prices and earnings of developing nations. One reason for this is the very high cost of operating them and the general lack of support by developed nations since they would have to shoulder most of the burden of setting up and running these international agreements. To be noted is that in the evaluation of international commodity agreements, it is important to determine whether prices or earnings are to be stabilized and whether instability results from shifts in the demand curve or in the supply curve. (This is left as an end-of-chapter problem.)

A modest compensatory financing scheme was set up in 1969 by the International Monetary Fund (IMF) for developing nations whose export earnings in any one year fell below the previous five-year moving average (this is discussed in Chapter 21). A similar scheme to stabilize export earnings was set up in 1975 with a $400 million fund by the European Union (EU) for the 57 Lomé Convention countries in Africa, the Caribbean, and the Pacific. However, these were very modest programs and fell far short of what developing nations demanded. Nevertheless, compensatory financing schemes could provide many of the benefits and avoid most of the problems associated with international commodity agreements.

11.5 Import Substitution versus Export Orientation

We now examine the reasons why developing nations want to industrialize and the advantages and disadvantages of industrialization through import substitution versus exports. We will then evaluate the results of the policy of import substitution, which most developing nations chose as their strategy for industrialization and development during the 1950s, 1960s, and 1970s. Afterward, we will examine the subsequent trend toward trade liberalization in most developing countries.

11.5A Development through Import Substitution versus Exports

During the 1950s, 1960s, and 1970s, most developing nations made a deliberate attempt to industrialize rather than continuing to specialize in the production of primary commodities (food, raw materials, and minerals) for export, as prescribed by traditional trade theory.

Industrialization was relied on to provide (1) faster technological progress, (2) the creation of high-paying jobs to relieve the serious unemployment and underemployment problems faced by most developing nations, (3) higher multipliers and accelerators through greater backward and forward linkages in the production process, (4) rising terms of trade and more stable export prices and earnings, and (5) relief from balance-of-payments difficulties that result because the demand of developing nations for manufactured products rises faster than their export earnings. The desire of developing nations to industrialize is natural in view of the fact that all rich nations are industrial while most poor nations are primarily agricultural.

Having decided to industrialize, developing nations had to choose between industrialization through import substitution or export-oriented industrialization. Both policies have advantages and disadvantages. An import-substitution industrialization (ISI) strategy has three main advantages: (1) The market for the industrial product already exists, as evidenced by imports of the commodity, so that risks are reduced in setting up an industry to replace imports. (2) It is easier for developing nations to protect their domestic market against foreign competition than to force developed nations to lower trade barriers against their manufactured exports. (3) Foreign firms are induced to establish so-called tariff factories to overcome the tariff wall of developing nations.

Against these advantages are the following disadvantages: (1) Domestic industries can grow accustomed to protection from foreign competition and have no incentive to become more efficient. (2) Import substitution can lead to inefficient industries because the smallness of the domestic market in many developing nations does not allow them to take advantage of economies of scale. (3) After the simpler manufactured imports are replaced by domestic production, import substitution becomes more and more difficult and costly (in terms of the higher protection and inefficiency) as more capital-intensive and technologically advanced imports have to be replaced by domestic production.

Export-oriented industrialization also has advantages and disadvantages. Advantages include the following: (1) It overcomes the smallness of the domestic market and allows a developing nation to take advantage of economies of scale. This is particularly important for the many developing countries that are both very poor and small. (2) Production of manufactured goods for export requires and stimulates efficiency throughout the economy. This is especially important when the output of an industry is used as an input of another domestic industry. (3) The expansion of manufactured exports is not limited (as in the case of import substitution) by the growth of the domestic market.

On the other hand, there are two serious disadvantages: (1) It may be very difficult for developing nations to set up export industries because of the competition from the more established and efficient industries in developed nations. (2) Developed nations often provide a high level of effective protection for their industries producing simple labor-intensive commodities in which developing nations already have or can soon acquire a comparative advantage.

During the 1950s, 1960s, and 1970s, most developing nations, particularly the larger ones, strongly opted for a policy of import substitution to industrialize. They protected their infant industries or stimulated their birth with effective tariff rates that rose sharply with the degree of processing. This was done at first to encourage the relatively simple step of assembling foreign parts, in the hope that subsequently more of these parts and intermediary products could be produced domestically (backward linkage). Heavy protection of domestic industries also stimulated the establishment of tariff factories in developing nations.

11.5B Experience with Import Substitution

The policy of industrialization through import substitution generally met with only limited success or with failure. Very high rates of effective protection, in the range of 100 to 200 percent or more, were common during the 1950s, 1960s, and 1970s, in such nations as India, Pakistan, Argentina, and Nigeria. These led to very inefficient domestic industries and very high prices for domestic consumers. Sometimes the foreign currency value of imported inputs was greater than the foreign currency value of the output produced (negative value added).

Heavy protection and subsidies to industry led to excessive capital intensity and relatively little labor absorption. For example, the capital intensity in the production of steel was almost as high in capital-poor nations such as India as it is in the capital-rich United States. This quickly exhausted the meager investment funds available to developing nations and created only a few jobs. The result was that most of the yearly increase in the labor force of most developing countries had to be absorbed into agriculture and the traditional service sector, thus aggravating their unemployment and underemployment problem. In addition, the hope of finding high-paying jobs in the modern urban sector attracted many more people to the cities than could find employment, leading to an explosive situation. The highest priority was given to the construction of new factories and the purchase of new machinery, with the result of widespread idle plant capacity for lack of funds to purchase needed raw material and fuel imports. One-shift operation of plants also contributed to excessive capital intensity and low labor absorption in developing nations.

The effort to industrialize through import substitution also led to the neglect of agriculture and other primary sectors, with the result that many developing nations experienced a decline in their earnings from traditional exports, and some (such as Brazil) were even forced to import some food products that they had previously exported. Furthermore, the policy of import substitution often aggravated the balance-of-payments problems of developing nations by requiring more imports of machinery, raw materials, fuels, and even food.

The overall result was that those developing nations (such as India, Pakistan, and Argentina) that stressed industrialization through import substitution fared much worse and grew at a much slower rate than those developing economies (such as Hong Kong, Korea, and Singapore) that from the early 1950s followed an export-oriented strategy (see Case Study 11-3). It has been estimated that the policy of import substitution resulted in the

CASE STUDY 11-3 The Growth of GDP of Rich Countries, Globalizers, and Nonglobalizers

Table 11.3 shows that globalizing developing countries (the so-called globalizers) grew much faster than rich countries and nonglobalizing developing countries (i.e., than the nonglobalizers) since the beginning of the 1980s, but not earlier. The rich countries were defined as the 24 OECD industrial countries plus the early globalizers (and relatively high-income economies) of Chile, Hong Kong, Singapore, South Korea, and Taiwan. Of the remaining 73 countries for which data were available, the top one-third of these developing countries (about 24 of them) in terms of growth of trade as a share of their GDP and in terms of reduction in their average tariff rates were defined as globalizers, while the remaining two-thirds of the countries (49 of them) were defined as nonglobalizers. Growth was measured as the weighted average increase of real GDP. Thus, globalization was clearly associated with more rapid growth since the beginning of the 1980s.

(continued)

■ CASE STUDY 11-3 Continued

■ TABLE 11.3. Average Growth of Real GDP of Rich Countries, Globalizers, and Nonglobalizers, 1960s–2000s (Percentage)

	1960s	1970s	1980s	1990s	2000s
Rich countries	4.7	3.1	2.3	2.2	1.6
Globalizers	1.4	2.9	3.5	5.0	5.0
Nonglobalizers	2.4	3.3	0.8	1.4	2.3

Sources: D. Dollar and A. Kraay, "Trade Growth and Poverty," *World Bank Research Paper*, March 2001, p. 38; and D. Salvatore, "Globalization, International Competitiveness, and Growth: Advanced and Emerging Markets, Large and Small Countries," *Journal of International Commerce, Economics and Policy*, April 2010, pp. 21–32.

waste of up to 10 percent of the national income of developing nations. It must be pointed out, however, that a policy of import substitution may be of some benefit in the early stages of development (especially for larger developing nations), while an export orientation becomes an absolute necessity later in the development process. Thus, rather than being alternatives, policies of import substitution and export orientation could profitably be applied to some extent sequentially, especially in the larger developing nations. This was in fact what Korea did.

11.5c Trade Liberalization and Growth in Developing Countries

Starting in the 1980s, many developing nations that had earlier followed an import substitution industrialization (ISI) strategy began to liberalize trade and adopt an outward orientation. The reforms were spurred by the debt crisis that began in 1982 (see Section 11.6b) and the evident success of the outward-oriented countries. Table 11.4 shows some trade-liberalizing measures adopted by some developing countries in Latin America, Africa, and Asia during the 1980s and early 1990s. In general, the reforms involved a dramatic reduction and simplification in average tariff rates and quantitative import restrictions. These, in turn, resulted in a much higher degree of openness, as measured by the sum of exports plus imports as a ratio of GDP, a sharp increase in the ratio of manufactures in total exports (see Case Study 11-4), and higher rates of growth for the liberalizing economies. Trade reforms were most successful when launched in a single bold move rather than with a number of small hesitant steps over time and when accompanied by anti-inflationary measures.

The World Bank has greatly facilitated the planning and carrying out of trade liberalization programs with technical assistance and loans. The World Bank began its lending for structural adjustment in 1980, and by 1995 it had lent more than $20 billion to more than 60 countries for the purpose of implementing structural or sectoral reforms. The largest number of loans went to Sub-Saharan African countries, but since these loans were generally small, a much larger amount went to other developing countries. The fact that many of the liberalizing developing countries have joined the General Agreement on Tariffs and Trade (GATT, see Section 9.6b) and that the Uruguay Round was successfully concluded

TABLE 11.4. Trade Reforms in Selected Developing Countries

Country	Reforms
Argentina	Average tariff levels were reduced from 18 percent to 11 percent and import licensing restrictions were substantially eased in 1991. The highest tariff rate was cut by another 15 percentage points in 1992.
Brazil	Major trade reforms were announced in March 1990 to replace almost all quotas with tariffs. Average tariff rates were reduced from 37 percent to 25 percent in 1990, to 21 percent in 1992, and to 14 percent in 1994.
Chile	In 1973 all quotas were removed, and a uniform tariff of 10 percent was imposed on all goods except automobiles. The tariff was raised to 15 percent following the economic crisis of the early 1980s.
China	A 1992 agreement began significant import liberalization, including a phaseout of almost 90 percent of all NTBs by 1998.
Egypt	The import quota on all tradable goods was reduced from 37 percent in 1990 to 23 percent in 1991 and 10 percent in 1992, and in 1993 the highest tariff rate was reduced from 100 percent to 80 percent.
India	Restrictive import licensing requirements covering 70 percent of all imports were eliminated in 1992, and the peak tariff was reduced from 110 percent to 85 percent in 1993.
Mexico	Quotas were substantially reduced starting in 1985. By 1988, tariffs were reduced to an average of 11 percent, with a maximum rate of 20 percent.
Philippines	Trade reform was adopted in 1991 to reduce the average tariff rate from 28 percent to 20 percent by 1995. Some quotas were also lifted.
Turkey	Quotas and other NTBs barriers have been substantially reduced starting in 1980 and tariff reduced substantially in 1992.

Sources: D. Rodrik, ''The Rush to Free Trade in the Developing World: Why So Late? Why Now? Will It Last?'' *NBER Working Paper No. 3947*, January 1992, pp. 3–4; and S. Hickok, ''Recent Trade Liberalization in Developing Countries,'' *Quarterly Review*, Federal Reserve Bank of New York, Autumn 1993, p. 3.

CASE STUDY 11-4 Manufactures in Total Exports of Selected Developing Countries

Table 11.5 gives the percentage of manufactured exports in the total merchandise exports of selected developing countries in Africa, Asia, and Latin America in 1983 and 2010. The table shows that the structure of exports of all the countries shown in the table changed dramatically toward manufactures during the period examined. This is especially true for South Africa and Malaysia (where it nearly tripled) and in Thailand, Argentina, and Mexico (where it doubled). Thus, the stereotype of developing countries exporting raw materials and foods and importing manufactured goods is no longer true. Even the conclusion that most manufactured exports of developing countries are simple, labor-intensive products is no longer valid, especially for the most advanced of the developing countries, such as Malaysia and Brazil (among the countries listed in the table).

(*continued*)

■ CASE STUDY 11-4 Continued

■ TABLE 11.5. Manufactures Exports as Percent of Total Merchandise Exports, Selected Developing Countries, 1983 and 2010

Africa	1983	2010	Asia	1983	2010	Latin America	1983	2010
Egypt	12	43	India	52	64	Argentina	16	33
Kenya	15	35	Malaysia	25	67	Brazil	39	37
South Africa	18	47	Pakistan	63	74	Chile	7	13
Tunisia	44	76	Thailand	31	75	Mexico	37	76

Source: World Bank, *World Development Indicators*, Various Issues.

(see Section 9.7A) consolidated the reforms already undertaken and encouraged further reforms. These promoted higher productivity and growth in most developing countries during this decade.

11.6 Current Problems Facing Developing Countries

In this section, we examine the most serious problems facing developing countries today. These are: (1) the conditions of stark poverty prevailing in many countries, particularly those of sub-Saharan Africa; (2) the unsustainable foreign debt of some of the poorest developing countries; and (3) the remaining trade protectionism of developed countries against developing countries' exports. Let us briefly examine each of these problems.

11.6A Poverty in Developing Countries

Table 11.6 gives the population and the per capita income in 2010, the growth in real per capita income from 1990 to 2010, and infant mortality and life expectancy in 1990 and 2010 in various groups of countries. The table shows that the average per capita income of all developing economies and former communist countries was only $3,304 in 2010 ($1,340 and $4,260 for India and China, respectively) as compared with $38,658 in high-income advanced economies. Worse still, the average growth of real per capita income was only 1.1 percent in sub-Saharan Africa (as a result of drought, wars, rapid population growth, the spread of the HIV virus, and the general failure of the development effort), 1.8 percent in the developing countries of Europe and Central Asia (because of economic restructuring after the collapse of communism), and 2.3 percent in the Middle East and North Africa (because of wars, political turmoil, and the sharp decline in petroleum prices during the 1990s).

The average growth of real per capita income was also relatively low (2.2 percent) in Latin America and the Caribbean between 1990 and 2010 because of political turmoil and failure in the development effort. Only in East Asia and the Pacific economies (and in particular, in China) did the real per capita income increase very rapidly from 1990 to 2010. In South Asia, the growth of real per capita income, although not as spectacular as in

■ TABLE 11.6. Population and Economic and Health Indicators, 1990–2010

Country/Region	Population in 2010 (Millions)	Income per Capita: Dollars 2010	Income per Capita: Growth Rate 1990–2010 (% per year)	Infant Mortality Rate per 1,000 Live Births: 1990	Infant Mortality Rate per 1,000 Live Births: 2010	Life Expectancy Birth (years): 1990	Life Expectancy Birth (years): 2010
Low and middle income	5,732	3,304	3.8	69	45	63	68
Sub-Saharan Africa	862	1,165	1.1	109	76	50	54
East Asia and Pacific	1,957	3,691	7.9	42	20	67	72
of which China	1,338	4,260	9.9	37	16	68	73
South Asia	1,591	1,213	4.7	89	52	58	65
of which India	1,171	1,340	5.3	84	48	58	65
Europe and Central Asia	408	7,214	1.8	41	19	68	71
Middle East and N. Africa	337	3,839	2.3	58	27	64	72
Latin America and Caribbean	578	7,802	2.2	42	18	68	74
High-income economies	1,123	38,658	1.7	10	5	75	80
World	6,855	9,097	1.6	64	41	65	70

Sources: World Bank, *World Bank Report*, 2012 and *World Development Indicators*, 2012.

East Asia, was very respectable. The table also shows that infant mortality was much higher and life expectancy much lower in low-income developing countries than in high-income developed countries, but major improvements were made in both measures throughout the world from 1990 to 2010.

Despite the fact that the number of poor people in the world (defined by the World Bank as people who live on less than $1.25 per day) has been cut drastically during the past two-and-half decades of rapid globalization, there are still more than one billion poor people in the world today and more than 20,000 children die of starvation each day (see *Salvatore*, 2007 and 2010). The recent sharp increase in world food prices and the global financial crisis are now threatening to undo the achievements of the past in reducing world poverty and is a tragedy for the world poor.

It must be pointed out, however, that using exchange rates to convert the per capita income of other countries into dollars without taking into account differences in the purchasing power of money in each country greatly exaggerates differences in per capita incomes between high- and low-income economies—and this exaggeration is larger the lower the level of development of the country. A new measure of real per capita income based on the purchasing power of the currency in each nation indicates, for example, that the real per capita income of China was $7,570 in 2010 rather than $4,260 (as indicated in Table 11.6) and in India it was $3,560 rather than $2,580. Thus, per capita incomes adjusted for *purchasing-power parity (PPP)* greatly reduce measured differences in standards of living between high- and low-income countries; nevertheless, they remain very large (see the appendix to this chapter). Furthermore, income inequality is generally also much higher in developing countries than in developed ones (see *Campano and Salvatore*, 2006, and *Salvatore*, 2010).

11.6B The Foreign Debt Problem of Developing Countries

During the 1970s and early 1980s, developing countries accumulated a total foreign debt exceeding $1 trillion, which they found very difficult to service (i.e., repay the principal or even the interest on the debt). When Mexico was unable to service (pay the interest on) its foreign debt in August 1982, the world was plunged into a foreign debt crisis. As part of the deal to renegotiate their debts, developing nations were required by the International Monetary Fund (IMF) to adopt austerity measures to reduce imports and to cut inflation, wage increases, and domestic programs. By 1994 the foreign debt problem was more or less resolved (i.e., made manageable) for middle-income developing countries but not for the poorest heavily indebted developing countries (most of which were in sub-Saharan Africa). In June 1999, the G-7 group of seven leading industrial nations wrote off up to 90 percent of the debt that the world's most indebted nations owed to their governments.

The financial crisis in East Asia in 1997–1998, Russia in 1998, Brazil in 1999 and 2002, and Turkey and Argentina in 2000–2002 caused the foreign debt of these nations to shoot up. This required rescue packages (promises of financial aid) by the International Monetary Fund, the World Bank, and private banks of $58 billion for Korea, $42 for Indonesia, $41 billion for Brazil, $23 billion for Russia, and $17 billion for Thailand from July 1997 through October 1998. In February 2002, the IMF extended a $16 billion loan to Turkey to help it overcome the financial crisis, but refused to do so for Argentina (which defaulted on its $140 billion foreign debt—the largest in history—in December 2001). In August 2002, the IMF extended a $30 billion loan to Brazil to restore confidence and stem a massive capital outflow. By 2003, growth had resumed in Argentina and by 2005 Argentina had restructured its debt and repaid all IMF loans. In December 2005, Brazil also repaid all of its IMF loans. Despite the fact that by 2011 the foreign debt of most developing countries had improved, it still remained serious for some of them (see Case Study 11-5).

■ CASE STUDY 11-5 The Foreign Debt Burden of Developing Countries

Table 11.7 shows the total foreign debt, the foreign debt as a percentage of GNI, and the foreign debt service (interest and amortization payments on the debt) as a percentage of exports for all developing countries together and for developing countries in each geographical region in 1980 (i.e., before the official start of the Latin American debt crisis in 1982), in 1995 (before the start of the financial crisis in East Asia in 1997), and in 2010. From the table, we see that the total foreign debt of all developing countries was $580 billion in 1980 (the largest component of which was the $257 billion foreign debt of the Latin American and Caribbean countries). The total debt increased sharply to $1,860 billion by 1995, and again to $4,076 billion by 2010.

The table also shows that the total foreign debt as a percentage of GNI increased sharply from 1980 to 1995, but then it declined just as sharply by 2010, except for Europe and Central Asia (because of the disruptions arising from the collapse of communism). The foreign debt service as a percentage of exports also increased from 1980 to 1995 (except for East Asia and the Pacific and for Latin America and the Caribbean), but it then declined in all regions, except for Europe and Central Asia by 2009. Although less serious than in the 1980 and 1990s, many developing nations were still facing serious foreign debt problems in 2010, despite the fact that the rich countries had cancelled $55 billion of the debt owed by the poorest developing countries at the end of 2005.

(continued)

CASE STUDY 11-5 Continued

TABLE 11.7. Developing Countries' Foreign Debt Indicators, 1980, 1995, 2010

	Total Debt (billion $)			Debt as % of GNI			Debt Service as % of Exports		
	1980	1995	2010	1980	1995	2010	1980	1995	2009*
All developing countries	580	1, 860	4, 076	21	39	21	13	18	11
Sub-Saharan Africa	61	236	206	24	76	20	7	16	6
East Asia and Pacific	65	456	1, 014	16	36	14	27	13	5
South Asia	38	152	401	16	32	19	12	30	7
Europe and Central Asia	76	246	1, 273	8	33	43	7	11	27
Middle East and N. Africa	83	162	144	22	59	14	6	21	—
Latin America and Caribbean	257	609	1, 039	36	36	22	36	27	18

* = 2010 data not available.
Source: World Bank, *World Development Indicators*, 2011, various issues.

11.6c Trade Problems of Developing Countries

During the 1980s, developed countries, beset by slow growth and large unemployment, increased the trade protection they provided to some of their large industries (such as textiles, steel, shipbuilding, consumer electronic products, television sets, shoes, and many other products) against imports from developing countries. These were the very industries in which developing countries had gained or were gaining a comparative advantage. A great deal of the new protectionism was directed especially against the manufactured exports of the High-Performance Asian economies (HPAEs), then called newly industrialized economies (NIEs). These economies (Hong Kong, Korea, Singapore, and Taiwan) were characterized by rapid growth in gross domestic product (GDP), in industrial production, and in manufactured exports. By 1993, nearly a third of developing countries' exports to industrial countries were restricted by quotas and other nontariff trade barriers (NTBs).

Had the trend toward increased protectionism continued, it could have led to a revival (and justification) of export pessimism and a return to inward-looking policies in developing countries (see *Salvatore*, 2012). Fortunately, the successful completion of the Uruguay Round in December 1993 prevented this (see Section 9.7A). Although most of the liberalization that took place was in trade among developed countries, developing countries also benefited (refer to Case Study 9-7). The *Doha Round* (see Section 9.7B), launched in November 2001, was supposed to be a "development round" by dealing with the trade demands of developing countries. Sharp disagreements between developed and developing nations, and among developed nations themselves, however, have prevented its completion.

In June 1974, the General Assembly of the United Nations called for the establishment of a New International Economic Order (NIEO) with the aim of (1) renegotiating the international debt of developing countries and reducing interest payments, (2) negotiating international commodity agreements, (3) establishing preferential access in developed nations' markets to all the manufactured exports of developing nations, (4) removing trade barriers on agricultural products in developed nations, (5) increasing the transfer of technology to developing nations and regulating multinational corporations, (6) increasing the yearly flow of foreign aid to developing nations to 0.7 percent of rich nations' income, and (7) allowing developing nations a greater role in international decision making. Most of these same demands had been made previously at various United Nations Conferences on Trade and Development (UNCTAD) held every four years since 1966. However, the slowdown in the world economy during the 1980s and early 1990s led most industrial countries to turn inward to address their own internal problems of slow growth and unemployment, leading to the demise of the NIEO as a hotly debated issue.

Nevertheless, growth has increased and poverty has fallen in many developing countries during the past three decades of rapid globalization. There is also an increased awareness in the world today that the major cause of poverty in some of the poorest developing countries is internal and due to wars, corruption, political instability, disease, and natural calamities. In 2000, the World Bank sponsored the *Millennium Development Goals (MDG)*, which proposed a program for rich countries to help the poorest developing countries stimulate growth, reduce poverty, and promote sustainable development.

In 2010, developed countries as a group gave only 0.21 percent of their GDP in foreign aid and so did the United States—most of it bilateral. The reduction in trade restrictions and protectionism from the implementation of the Uruguay Round agreement, however, provided major trade benefits to developing countries (see Case Study 11-6).

CASE STUDY 11-6 Globalization and World Poverty

Although globalization is often accused of increasing world poverty, the fact is that world poverty would probably be even more widespread without globalization. What is true is that globalization did not benefit all nations. Some of the poorest nations in the world (especially those in sub-Saharan Africa) seem to have been left behind and marginalized by globalization, and they were poorer (i.e., their average real per capita income was lower) in the year 2000 than in 1980. The cause of their poverty, however, is not globalization but drought, famine, internal strife, war, and AIDS. What globalization can be blamed for is not spreading the benefits of increased efficiency and openness that come with globalization more evenly and equitably to all nations.

The World Bank has estimated that the number of very poor people (those living on less than $1.25 per day) declined by about 650 million from 1981 to 2005 (see *Shaohua and Ravillion*, 2008). Without globalization, that number would have been higher, not lower. But there remain about 1 billion people living mostly in nonglobalizing nations facing stark poverty and thousands of children that die of starvation each day.

Trying to overcome this tragedy, 189 countries signed the Millennium Declaration in September 2000, adopting the *Millennium Development Goals (MDGs)*, a set of eight objectives incorporating specific targets for reducing income poverty, tackling other sources of human deprivation, and promoting sustainable development by 2015. The eight MDGs are (1) halve extreme poverty and hunger relative to 1990; (2) achieve universal education; (3) promote gender equality; (4) reduce child mortality; (5) improve maternal health; (6) combat HIV/AIDS, malaria, and other diseases; (7) ensure environmental sustainability; and (8) establish a global partnership for development.

(continued)

CASE STUDY 11-6 Continued

Jeffrey Sachs (2005) has indicated that most of these goals could be reached if rich nations provided 0.7 percent of their GDP (about $281 billion, as compared with $129 billion in 2009) in aid to developing countries as requested by the United Nations. Only a handful of countries provide 0.7 percent or more of their GDP in foreign aid. Most of the others have promised to increase their foreign aid to 0.5 percent of the GDP by 2010 and to 0.7 by 2015.

Sources: World Bank, *Globalization, Growth and Poverty* (Washington, D.C.: World Bank, 2002); D. Dollar and A. Aart, "Trade, Growth and Poverty," and "Growth Is Good for the Poor," *World Bank Working Papers*, 2002; J. Sachs, *The End of Poverty* (New York: Penguin Press HP, 2005); and D. Salvatore, "Globalization, Growth, Poverty and Goverance," in G. Cipollone, ed., *Globalization, Growth and Ethics* (Rome: Gregorian University Press, 2010), pp. 169–185.

SUMMARY

1. Although the level and the rate of economic development depend primarily on internal conditions in developing nations, international trade can contribute significantly to the development process. Some economists, however, notably Prebisch, Singer, and Myrdal, believed that international trade and the functioning of the present international economic system benefited developed nations at the expense of developing nations.

2. Even though the need for a truly dynamic theory of trade remains, the technique of comparative statics can extend traditional trade theory to incorporate changes in factor endowments, technology, and tastes. Because of less favorable demand and supply conditions, international trade today cannot be expected to be the engine of growth that it was for the regions of recent settlement in the nineteenth century. However, trade can still play a very important supportive role.

3. The commodity, or net barter, terms of trade (N) measure the movement over time in the nation's export prices relative to its import prices. The income terms of trade (I) measure the nation's export-based capacity to import. The single factoral terms of trade (S) measure the amount of imports the nation gets per unit of domestic factors embodied in its exports. I and S are more important than N for developing nations, but most of the discussion and controversy have been in terms of N (since it is the easiest to measure). I and S can rise even if N declines. Prebisch and Singer have argued that N has a tendency to decline for developing nations because most of their productivity increases are reflected in lower prices for their agricultural exports. Empirical studies indicate that for developing nations N has declined over the past century but I has increased substantially because of sharply rising volumes of exports.

4. Independently of deteriorating long-run or secular terms of trade, developing nations also face larger short-run fluctuations in their export prices and earnings than developed nations because of price-inelastic and unstable demand for supply of their exports. However, the absolute level of export instability is not very great, and, in most cases, it does not seem to have interfered with development. In the past, developing nations demanded international commodity agreements to stabilize and increase their export prices and earnings. These involve buffer stocks, export controls, or purchasing agreements. Only a very few of these are in operation today, and none seems particularly effective. The large expenditures that would be required to set up and run commodity agreements may not represent the best use of resources.

5. During the 1950s, 1960s, and 1970s, most developing nations made a deliberate attempt to industrialize through the policy of import substitution. The results were generally inefficient industries, excessive capital intensity and little labor absorption, neglect of agriculture, and even greater balance-of-payments problems. Since the late 1980s, many developing nations have shifted toward export-oriented policies and are paying more attention to their agriculture.

6. The most serious problems facing developing countries today are (1) the conditions of stark poverty prevailing in many countries, particularly those of sub-Saharan Africa, (2) the unsustainable foreign debt of many of the poorest developing countries, especially those of sub-Saharan Africa, and (3) the protectionism in developed countries against developing countries' exports. Developing countries sought to overcome these problems by demanding a New International Economic Order (NIEO) at the United Nations and its special agency UNCTAD. Globalization is not the cause of world poverty, but globalization has not benefited all countries. In 2000, the World Bank sponsored the *Millennium Development Goals (MDG)*, which proposed a program for rich countries to help the poorest developing countries stimulate growth, reduce poverty, and promote sustainable development. As of 2012, most of those goals have not been achieved.

A LOOK AHEAD

So far, we have dealt almost exclusively with commodity trade and have assumed no international resource movement. However, capital, labor, and technology do move across national boundaries. In the next chapter (the last in Part Two), we analyze the costs and benefits of international resource movements for the nations involved. Since multinational corporations are an important vehicle for the international flow of capital, labor, and technology, we also devote a great deal of attention to this relatively new and crucial type of economic enterprise.

KEY TERMS

Buffer stocks, p. 345
Commodity, or net barter, terms of trade, p. 338
Double factoral terms of trade, p. 339
Endogenous growth theory, p. 336
Engine of growth, p. 334
Export controls, p. 345
Export instability, p. 344
Export-oriented industrialization, p. 347
Export pessimism, p. 354
Foreign debt, p. 353
High-performance Asian economies (HPAEs), p. 337
Import-substitution industrialization (ISI), p. 347
Income terms of trade, p. 338
International commodity agreements, p. 345
Marketing boards, p. 345
New International Economic Order (NIEO), p. 354
Newly industrialized economies (NIEs), p. 354
Purchase contracts, p. 346
Regions of recent settlement, p. 333
Single factoral terms of trade, p. 338
United Nations Conferences on Trade and Development (UNCTAD), p. 355
Vent for surplus, p. 335

QUESTIONS FOR REVIEW

1. Why did some economists regard traditional trade theory as irrelevant for developing nations and the development process? How can this charge be answered?

2. In what way was international trade an engine of growth for the regions of recent settlement during the nineteenth century?

3. Why can international trade not be expected to be an engine of growth for today's developing nations? In what ways can international trade still play a very important supportive role for development today?

4. What is meant by the commodity, or net barter, terms of trade? the Income terms of trade? the single factoral terms of trade? the double factoral terms of trade? Which are the most significant terms of trade for developing nations? Why?

5. What reasons did Prebisch, Singer, and Myrdal give for their belief that the commodity terms of trade of developing nations have a tendency to deteriorate over time?

6. What criticisms have been levied against the United Nations study that Prebisch and Singer quoted in their work to confirm their belief?

7. What conclusions can be reached on the basis of the many empirical studies conducted as to the movement of the commodity and income terms of trade of developing nations over the past century and especially since World War II?

8. What is export instability? What are the alleged causes and effects of export instability on economic development? What are the results of empirical studies on export instability and its effects on economic development?

9. What are international commodity agreements? Why do developing nations want them? What is meant by buffer stocks, export controls, and purchasing agreements? Can you give an example of each?

10. Why do developing nations want to industrialize? What is meant by import substitution? by export-oriented policies? What are the advantages and disadvantages of each as a method of industrialization for developing nations?

11. What has been the experience with import substitution during the past decades? What has this experience led to?

12. What are the major problems facing developing countries today? What are their causes?

13. Which region of the world has the largest concentration of poorest countries? Why are these countries so poor?

14. How do developing countries propose to resolve the major problems that they face today? What are the prospects of resolving them in the near future?

15. Has globalization increased or reduced world poverty? What is the World Bank agenda for reducing world poverty?

PROBLEMS

1. Indicate all the ways in which international trade could retard development.

2. Counter each of the criticisms in your answer to Problem 1 that international trade could retard economic development.

3. Draw a hypothetical production frontier for a developing nation exhibiting increasing costs. Have the horizontal axis measure primary commodities and the vertical axis measure manufactured goods. Show on your figure the effect on the nation's production frontier of an improvement in the technology of primary production.

4. What effect is an improvement in the technology of primary production likely to have on the terms of trade of a developing country? Why? (*Hint*: See Chapter 7.)

5. Draw a figure showing how trade could be a vent for surplus.

***6.** Taking the index of export prices, import prices, volume of exports, and productivity in the export sector in a developing nation to be all equal to 100 in 1980, in 2010 what would be:

(a) The commodity terms of trade of this nation if the index of its export prices rises by 10 percent but the index of its import prices rises by 20 percent?

(b) This nation's income terms of trade if the index of export volume grows to 130 by 2010?

(c) This nation's single factoral terms of trade if its productivity index in the export sector rises to 140 by 2010?

***7.** Is the nation in Problem 6 better or worse off in 2010 as compared with 1980? Why?

***8.** Explain with the use of a graph how deteriorating terms of trade resulting from growth can make a developing nation worse off after growth than before.

9. Draw a figure showing that when the supply of a commodity increases, its equilibrium price will fall

* = Answer provided at www.wiley.com/college/salvatore.

by a greater amount the more price-inelastic is the demand curve for the commodity.

10. Draw two figures showing that with a negatively inclined demand curve and a positively inclined supply curve, producers' earnings fluctuate more with a shift in demand than with a shift in supply.

11. With the use of a diagram, show how a buffer stock could lead either to an unmanageable stock or to the buffer authority running out of the commodity.

12. Why has the New International Economic Order demanded by developing countries not been established? Why is this no longer a hotly debated topic?

13. In what way did the implementation of the Uruguay Round help developing nations? In what way did it not?

14. Explain why immiserizing growth does not seem to have occurred in most developing countries over the past three decades.

15. Explain the reason rich nations should and should not forgive all of the foreign debt of the poorest developing countries.

APPENDIX

A11.1 Income Inequalities by Traditional and Purchasing-Power Parity (PPP) Measures

Table 11.8 shows the per capita income of various countries when measured the traditional way (i.e., by simply using the official exchange rate to express the per capita incomes of various countries in terms of the U.S. dollar) and after adjustment to take into account the difference in the purchasing power of money in different countries. Note that according to the traditional measure, the per capita income in the United States is 11.1 times larger than China's, but this falls to 6.2 times when adjusted for the difference in the purchasing power of the national currency in each country. Note also that according to the traditional measure, the U.K's per capita income ($38,540) was the sixth highest for the countries listed in the table, but it rises to fourth place (after the United States, Germany, and Canada) in terms

TABLE 11.8. Traditional and Purchasing Power Parity (PPP) per Capita Incomes of Selected Countries in 2010

Traditional Method		PPP Method	
United States	$47,140	United States	$47,020
Germany	43,330	Germany	38,170
France	42,390	Canada	37,280
Japan	42,150	United Kingdom	36,580
Canada	41,950	Japan	34,790
United Kingdom	38,540	France	34,440
Italy	35,090	Spain	31,550
Spain	31,650	Italy	31,090
Brazil	9,390	Mexico	15,010
Mexico	9,330	Brazil	10,920
China	4,260	China	7,570
India	1,340	India	3,560
Burundi	160	Burundi	390

Source: World Bank, *World Development Report*, 2012.

of PPP because of the generally higher cost of living in Germany and Canada than in the United Kingdom. By either measure, the United States still enjoys the highest standard of living. Finally, note that the traditional method makes the U.S. per capita income 295 times higher than that of Burundi (the poorest country in the world), but with PPP it falls to 121 times—still an abyss.

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INTERNet

The data and other information used in this chapter are found in the *2012 World Bank's World Development Report*, the International Monetary Fund's (IMF) *2011 International Financial Statistics* and *World Economic Outlook*, the United Nations Conference on Trade and Development's (UNCTADs) *2011 Trade and Development Report*, and the United Nations Development Program's (UNDPs) *2011 Human Development Report*. All reports, except International Financial Statistics, can be accessed through the Internet by clicking the name of the report after accessing the organization web site at:

http://www.worldbank.org

http://www.imf.org

http://www.unctad.org

http://hdr.undp.org

International Resource Movements and Multinational Corporations

chapter 12

LEARNING GOALS:

After reading this chapter, you should be able to:

- Describe the motives for international portfolio and direct investments
- Describe the effects of portfolio and direct investments on investing and host countries
- Understand the reasons for the existence of multinational corporations and their effects on the home and host countries
- Understand the motives and effects of international labor migrations

12.1 Introduction

So far, we have dealt almost exclusively with commodity trade and have assumed no international resource movement. However, capital, labor, and technology do move across national boundaries. In some ways, international trade and movements of productive resources can be regarded as substitutes for one another. For example, a relatively capital-abundant and labor-scarce country, such as the United States, could either export capital-intensive commodities or export capital itself, and either import labor-intensive products or allow the immigration of workers from countries with plentiful labor supplies. As in the case of international trade, the movement of productive resources from nations with relative abundance and low remuneration to nations with relative scarcity and high remuneration has a tendency to equalize factor returns internationally and generally increases welfare.

International trade and movements of productive factors, however, have very different economic effects on the nations involved. In this chapter, we focus on the cost and benefits of international resource movements. Since multinational corporations are an important vehicle for the international flows of capital, labor, and technology, we also devote a great deal of attention to this relatively new and crucial type of economic enterprise.

There are two main types of foreign investments: portfolio investments and direct investments. Portfolio investments are purely financial assets, such as bonds, denominated in a national currency. With bonds, the investor simply lends capital to get fixed payouts or a return at regular intervals and then receives the face value of the bond at a prespecified date. Most foreign investments prior to World War I were of this type and flowed primarily from the United Kingdom to the "regions of recent settlement" for railroad construction and the opening up of new lands and sources of raw materials. The U.S. government defines as a portfolio investment stock purchases that involve less than 10 percent of the voting stock of a corporation. (A purchase of 10 percent or more of the voting stock of a corporation is regarded as a direct investment.) With stocks the investor purchases equity, or a claim on the net worth of the firm. Portfolio or financial investments take place primarily through financial institutions such as banks and investment funds. International portfolio investments collapsed after World War I and have only revived since the 1960s.

Direct investments, on the other hand, are real investments in factories, capital goods, land, and inventories where both capital and management are involved and the investor retains control over use of the invested capital. Direct investment usually takes the form of a firm starting a subsidiary or taking control of another firm (for example, by purchasing a majority of the stock). Any purchase of 10 percent or more of the stock of a firm, however, is defined as direct investment by the U.S. government. In the international context, direct investments are usually undertaken by multinational corporations engaged in manufacturing, resource extraction, or services. Direct investments are now as important as portfolio investments as forms or channels of international private capital flows.

In Section 12.2, we present some data on international capital flows. In Section 12.3, we examine the motives for portfolio and direct investments abroad. In Section 12.4, we analyze the welfare effects of international capital flows on investing and host countries. Section 12.5 deals with multinational corporations—the reasons for their existence and some of the problems they create. Finally, in Section 12.6, we discuss the reasons for and welfare effects of the international migration of labor in general and of skilled labor in particular. The appendix deals with the so-called transfer problem associated with international capital flows.

12.2 Some Data on International Capital Flows

We now present some data on the size and composition of U.S. capital investments in foreign nations and foreign capital investments in the United States from 1950 to 2010.

We can see from Table 12.1 that both U.S. private holdings of foreign long-term securities (stocks and bonds) and foreign private holdings of U.S. long-term securities increased very rapidly from 1950 to 2010, with the latter a little greater than the former at the end of 2010. Table 12.1 also shows the value of U.S. *direct* investments abroad and foreign *direct* investments in the United States at the end of various years. Foreign direct investments are valued at historical cost, at current or replacement cost, and at market value (i.e., using stock market prices). Figures for foreign direct investments at current cost are available only from 1976. The need to supplement the historical values of foreign direct investments with those at current cost and at market value arises because most U.S. foreign direct investments occurred in the 1960s and 1970s and require larger adjustments for the cumulative effects of inflation than foreign direct investments in the United States, which occurred mostly since the 1980s. Table 12.1 shows that both the stock of U.S. direct investments abroad

TABLE 12.1. U.S. Foreign Long-Term Private International Investment Position in Selected Years, 1950–2010 (billions of U.S. dollars, at historical-cost and current-cost basis, at year end)

Year	1950	1960	1970	1980	1985	1990	1995	2000	2005	2010
U.S. assets abroad										
Foreign securities	4.3	9.5	20.9	62.5	119.4	342.3	1, 203.9	2, 425.5	4, 329.3	6, 222.9
Direct investments at:										
Historical cost	11.8	31.9	75.5	214.5	230.3	421.5	711.6	1, 316.2	2, 241.7	3, 908.2
Current cost	—	—	—	388.1	371.0	616.7	885.5	1, 531.6	2, 651.7	4, 429.4
Market value	—	—	—	—	386.4	731.8	1, 363.8	2, 694.0	3, 638.0	4, 843.3
Foreign assets in the U.S.										
U.S. securities	2.9	9.3	34.8	74.1	207.9	460.6	969.8	2, 623.0	4, 353.0	5, 860.1
Direct investments at:										
Historical cost	3.4	6.9	13.3	83.0	184.6	403.7	560.1	1, 256.9	1, 634.1	2, 342.8
Current cost	—	—	—	127.1	247.2	505.3	680.1	1, 421.0	1, 906.0	2, 658.9
Market value	—	—	—	—	220.0	539.6	1, 005.7	2, 783.2	2, 810.0	3, 451.4

Source: U.S. Department of Commerce, *Survey of Current Business* (Washington, D.C.: U.S. Government Printing Office, various issues).

and foreign direct investments in the United States also increased very rapidly from 1950 to 2010 and were higher at market values than at current cost.

Table 12.2 shows that from 1950 and 2010, the stock of U.S. direct investments in Europe grew much more rapidly than the stock of U.S. direct investments in Canada and Latin America. This was due to the rapid growth of the European Union and the desire on the part of the United States to avoid the common external tariff imposed by the EU on imports from outside the EU. Note that U.S. direct investments in Latin America were actually lower in 1985 than in 1980 as a result of the international debt problem of the Latin American countries (discussed in Section 11.6B). Also note that U.S. direct investments in Japan increased less than elsewhere in the 1990s because of stagnation in Japan during that decade.

TABLE 12.2. U.S. Direct Investments Abroad by Area in Selected Years, 1950–2010 (billions of U.S. dollars, at historical-cost basis, at year end)

Year	Total	Canada	Europe	Latin America	Asia and Pacific	of which Japan	Others
1950	$ 11.8	$ 3.6	$ 1.7	$ 4.6	$ 0.3	$ 0.0	$ 1.6
1960	31.9	11.2	7.0	8.4	1.2	0.3	4.1
1970	78.2	22.8	24.5	14.8	8.3	1.5	7.8
1980	215.6	45.0	96.5	38.9	25.3	6.2	9.9
1985	230.3	46.9	105.2	28.3	35.3	9.2	14.6
1990	421.5	68.4	204.2	72.5	63.6	21.0	12.8
1995	711.6	81.4	363.5	122.8	126.0	39.2	17.9
2000	1, 316.2	132.5	687.3	266.6	207.1	57.1	22.7
2005	2, 241.7	233.5	1, 110.0	365.9	380.5	79.3	45.6
2010	3, 908.2	296.7	2, 185.9	724.4	611.1	113.3	23.2

Source: U.S. Department of Commerce, *Survey of Current Business* (Washington, D.C.: U.S. Government Printing Office, various issues).

TABLE 12.3. U.S. Foreign Long-Term Private International Investment Position in Selected Years, 1950–2010 (billions of U.S. dollars, at historical-cost basis, at year end)

Year	1950	1960	1970	1980	1985	1990	1995	2000	2005	2010
U.S. investments abroad										
Manufacturing	3.8	11.1	31.0	89.3	94.7	168.0	250.3	343.9	449.2	585.8
Finance	—	—	—	—	22.5	109.4	228.7	257.2	518.5	803.0
Other	8.0	20.8	44.5	126.1	113.1	149.6	238.5	715.1	1,167.8	2,519.4
Total	11.8	31.9	75.5	215.4	230.3	427.0	717.5	1,316.2	2,135.5	3,908.2
Foreign investments in the U.S.										
Manufacturing	1.1	2.6	6.1	33.0	59.6	152.8	214.5	480.6	513.6	748.3
Finance	—	—	—	—	35.5	70.4	115.6	217.0	346.5	356.8
Other	2.3	4.3	7.2	50.0	89.5	171.7	205.5	559.3	734.4	1,237.7
Total	3.4	6.9	13.3	83.0	184.6	394.9	535.6	1,256.9	1,594.5	2,342.8

Source: U.S. Department of Commerce, *Survey of Current Business* (Washington, D.C.: U.S. Government Printing Office, various issues).

Table 12.3 separates U.S. direct investments abroad and foreign direct investments in the United States into manufacturing, finance (including depository institutions and insurance), and others (mostly services other than financial services). Data on finance are available only since 1985. The table shows that direct investments in finance and other categories grew much more rapidly that direct investments in manufacturing since 1985. Case Study 12-1 shows the yearly inflows of foreign direct investments into the United States from 1980 to 2010.

CASE STUDY 12-1 Fluctuations in Foreign Direct Investment Flows to the United States

Table 12.4 shows that the level of foreign direct investments (FDI) in the United States was $16.9 billion in 1980. It declined to $10.4 billion in 1983 (a recession year) before rising to $68.3 billion in 1989. Afterward, it declined to $19.8 billion in 1992 (another recession year) and then rose to the all-time high of $321.3 billion in 2000. It then declined to $63.8 billion in 2003 (a year of slow growth following the recession of 2001). It then rose to $310.1 billion in 2008 but then declined to $158.6 billion in 2009 because of a recession, and it was $236.2 billion in 2010. Thus, flows of FDI to the United States seem to be cyclical, rising during periods of high growth and falling during periods of recession or slow growth.

During the second half of the 1980s, many Americans became concerned that foreigners, particularly the Japanese, were "buying up" America. These fears subsided during the early 1990s, as slow growth and recession made FDI in the United States less attractive to foreigners. With the resumption of rapid growth in 1993, FDI in the United States shot up again to much higher levels than during the late 1980s, but with the United States doing much better in international competitiveness than in the 1980s (see Case Study 6-6), the new upsurge in FDI did not cause much concern and was actually welcomed as contributing to rapid growth in the U.S. economy. Foreign acquisitions of high-tech American firms in recent years, however, are causing some anxiety that this could undermine U.S. international competitiveness and threaten national security.

(continued)

CASE STUDY 12-1 Continued

TABLE 12.4. Foreign Direct Investment Flows to the United States in Selected Years, 1980–2010 (billions of U.S. dollars)

Year	FDI	Year	FDI
1980	$16.9	1996	86.5
1981	25.2	1997	105.6
1982	12.6	1998	179.0
1983	10.4	1999	289.4
1984	24.5	2000	321.3
1985	19.7	2001	167.0
1986	35.4	2002	84.4
1987	58.5	2003	63.8
1988	57.7	2004	146.0
1989	68.3	2005	112.6
1990	48.5	2006	243.2
1991	23.2	2007	221.2
1992	19.8	2008	310.1
1993	51.4	2009	158.6
1994	46.1	2010	236.2
1995	57.8		

Source: U.S. Department of Commerce, *Survey of Current Business* (Washington, D.C.: U.S. Government Printing Office, various issues).

12.3 Motives for International Capital Flows

In this section, we examine the motives for portfolio and direct investments abroad. While the motives for both types of foreign investments are basically the same, direct foreign investments require additional explanations not provided by the basic model that explains international portfolio investments.

12.3A Motives for International Portfolio Investments

The basic motive for international portfolio investments is to earn higher returns abroad. Thus, residents of one country purchase bonds of another country if the returns on bonds are higher in the other country. This is the simple and straight forward outcome of yield maximization and tends to equalize returns internationally. According to the basic (two-nation) Heckscher–Ohlin model, returns on capital are originally higher in the nation having the lower overall capital–labor ratio. Residents of one country may also purchase stock in a corporation in another country if they expect the future profitability of the foreign corporation to be greater than that of domestic corporations. (For simplicity, here we ignore the greater transaction and other costs usually involved in holding foreign securities.)

The explanation that international portfolio investments occur to take advantage of higher yields abroad is certainly correct as far as it goes. The problem is that it leaves one important fact unexplained. It cannot account for *observed* two-way capital flows. That is, if returns on securities are lower in one nation than in another nation, this could explain the flow of capital investments from the former nation to the latter but is inconsistent with the simultaneous flow of capital in the opposite direction, which is often observed in the real world (see Tables 12.1 and 12.3).

To explain two-way international capital flows, the element of risk must be introduced. That is, investors are interested not only in the rate of return but also in the risk associated with a particular investment. The risk with bonds consists of bankruptcy and the variability in their market value. With stocks, the risk consists of bankruptcy, even greater variability in market value, and the possibility of lower than anticipated returns. Thus, investors maximize returns for a given level of risk and generally accept a higher risk only if returns are higher.

For example, suppose that we deal with stocks and measure risk by the variability (variance) of returns about the average. Suppose also that both stocks A and B have a rate of return of 30 percent on average, but there is a fifty-fifty chance that the yield will be either 20 percent or 40 percent on stock A and 10 percent or 50 percent on stock B. Stock B is then clearly riskier than stock A. Since both stocks have the same yield on the average, investors should purchase stock A to minimize risks.

However, if the yield on stock A falls when the yield on stock B rises and vice versa (i.e., if changes in yields are inversely, or negatively, correlated over time), then by holding both stocks, the investor can still receive a yield of 30 percent on average but with a much lower risk. That is, the risk of a lower than average yield on stock A at any point is more or less matched by the tendency for the yield on stock B to be higher than average at the same time. As a result, the risk of a portfolio including *both* stock A and stock B is substantially reduced.

Portfolio theory thus tells us that by investing in securities with yields that are inversely related over time, a given yield can be obtained at a smaller risk or a higher yield can be obtained for the same level of risk for the portfolio as a whole. Since yields on foreign securities (depending primarily on the different economic conditions abroad) are more likely to be inversely related to yields on domestic securities, a portfolio including both domestic and foreign securities can have a higher average yield and/or lower risk than a portfolio containing only domestic securities.

To achieve such a balanced portfolio, a two-way capital flow may be required. For example, if stock A (with the same average yield but lower risk than stock B) is available in one country, while stock B (with yields inversely related to the yields on stock A) is available in another country, investors in the first nation must also purchase stock B (i.e., invest in the second nation), and investors in the second nation must also purchase stock A (i.e., invest in the first nation) to achieve a balanced portfolio. Risk diversification can thus explain two-way international portfolio investments.

Throughout the preceding discussion, it was implicitly assumed that investors know precisely the average return on stocks and their variability. In reality, this is seldom known in advance. Thus, investors must determine for themselves (from their market knowledge and intuition) what the average returns and variabilities are likely to be in deciding which stocks to purchase. Since different individuals can have different expectations for the same stocks, it is possible that some investors in each nation think that stocks in the other nation are a better buy. This provides an additional explanation for two-way international portfolio investments.

12.3B Motives for Direct Foreign Investments

The motives for direct investments abroad are generally the same as for portfolio investments, that is, to earn higher returns (possibly resulting from higher growth rates abroad, more favorable tax treatment, or greater availability of infrastructures) and to diversify risks. Indeed, it has been found that firms with a strong international orientation, either through exports or through foreign production and/or sales facilities, are more profitable and have a much smaller variability in profits than purely domestic firms.

Although these reasons are sufficient to explain international portfolio investments, they leave one basic question unanswered with regard to direct foreign investments. That is, they cannot explain why the residents of a nation do not borrow from other nations and themselves make real investments in their own nation rather than accept *direct* investments from abroad. After all, the residents of a nation can be expected to be more familiar with local conditions and thus to be at a competitive advantage with respect to foreign investors. There are several possible explanations for this. The most important is that many large corporations (usually in monopolistic and oligopolistic markets) often have some unique production knowledge or managerial skill that could easily and profitably be utilized abroad and over which the corporation wants to retain direct control. In such a situation, the firm will make direct investments abroad. This involves horizontal integration, or the production abroad of a differentiated product that is also produced at home.

For example, IBM has a particular computer technology over which it wants to retain direct control but which it can easily duplicate abroad so as to serve the foreign market better (by adapting to local conditions) than through exports. IBM does not want to license foreign producers because it wants to retain complete control over its trade secrets and patents and to ensure consistent quality and service. Even if IBM were willing to negotiate licensing agreements with foreign producers, this would not be feasible in view of the very rapid rate of technological innovations in the field. The situation is basically the same for General Electric, Nokia, Toyota, and many other multinational corporations, and it is the motive behind most direct foreign investments in manufacturing in developed nations.

Another important reason for direct foreign investments is to obtain control of a needed raw material and thus ensure an uninterrupted supply at the lowest possible cost. This is referred to as vertical integration and is the form of most direct foreign investments in developing countries and in some mineral-rich developed countries. Thus, American and foreign corporations own mines in Canada, Jamaica, Venezuela, Australia, and other nations, and foreigners own some coal mines in the United States. Vertical integration involving multinational corporations can also go *forward* into the ownership of sales or distribution networks abroad, as is the case with most of the world's major automobile producers.

Still other reasons for direct foreign investments are to avoid tariffs and other restrictions that nations impose on imports or to take advantage of various government subsidies to encourage direct foreign investments. Examples of the former are the large-scale direct investments made by U.S. firms in the EU countries and some direct foreign investments in manufacturing in developing nations. Examples of the latter are the direct foreign investments made in developing nations and in depressed regions of some developed nations. Other possible reasons for direct foreign investments are to enter a foreign oligopolistic market so as to share in the profits, to purchase a promising foreign firm to avoid its future competition and the possible loss of export markets, or because only a large foreign multinational corporation can obtain the necessary financing to enter the market.

Two-way direct foreign investments can then be explained by some industries being more advanced in one nation (such as the computer industry in the United States), while other industries are more efficient in other nations (such as the automobile industry in Japan). Direct foreign investments have been greatly facilitated (in a sense made possible) by the very rapid advances in transportation (i.e., jet travel) and communications (i.e., international telephone lines and international data transmission and processing) that have occurred since the end of World War II. These advances permit the headquarters of multinational corporations to exert immediate and direct control over the operations of their subsidiaries around the world, thus facilitating and encouraging direct investments abroad.

The regional distribution of foreign direct investments around the world also seems to depend on geographical proximity or established trade relations. For example, the United States is the main supplier of foreign direct investments to Latin America, Bangladesh, Pakistan, the Philippines, and Saudi Arabia; foreign direct investments from the European Union flow mostly to Ghana and Morocco in Africa, Brazil in Latin America, India, Sri Lanka, and Vietnam in Asia, and to the former communist countries in Eastern Europe; and Japan is the main supplier of foreign direct investments to South Korea, Singapore, Taiwan, and Thailand. Case Study 12-2 shows the inward and outward stock of foreign direct investment in various regions and selected countries and years.

12.4 Welfare Effects of International Capital Flows

In this section, we examine the welfare effects of international capital flows on the investing and host countries. Some of these effects can be shown graphically. These are examined first. Subsequently, we examine the effects not revealed in the graphical analysis. In order to isolate the effect of capital flows, we assume here that there is no trade in goods.

CASE STUDY 12-2 The Stock of Foreign Direct Investments Around the World

Table 12.5 shows the inward and outward stock of foreign direct investment (i.e., the stock of foreign direct investment made and received) by region and selected country in 1990, 2000, and 2010. The table shows that in 2010 the United States had by far the largest inward and outward stock of foreign direct investment (FDI). For the inward stock of FDI, the United States was followed by the United Kingdom, France, Germany, Spain, the Netherlands, Canada, Switzerland, Italy, and Japan, in that order. For the outward stock of FDI, the United States was followed by the United Kingdom, France, Germany, Switzerland, the Netherlands, Japan, Spain, Canada, and Italy.

In 2010, the inward stock of FDI of developing countries was 48 percent that of developed countries, while their stock of outward FDI was about 17 percent that of developed countries. Of the total inward stock of FDI of all developing countries, 62 percent was in Asia (with Hong Kong having by far the largest share) and 25 percent was in Latin America. The inward stock of FDI of Africa and Southeast Europe and CIS (Commonwealth of Independent States) was relatively small (see the table).

(continued)

CASE STUDY 12-2 Continued

TABLE 12.5. Stock of Outward and Inward FDI by Region and Selected Country in 1990, 2000, and 2010 (billions of U.S. dollars, at current-cost basis, at year end)

	Inward			Outward		
	1990	2000	2010	1990	2000	2010
Developed countries	$1,564	$5,653	$12,502	$1,949	$7,083	$16,804
United States[a]	540	2,783	3,451	732	2,694	4,843
United Kingdom	204	439	1,125	229	898	1,689
France	98	391	1,086	112	926	1,523
Germany	111	272	674	152	542	1,421
Spain	66	156	614	16	129	660
Netherlands	69	244	590	107	305	890
Canada	113	213	561	85	238	616
Switzerland	34	87	539	66	232	909
Italy	60	121	337	60	180	476
Japan	10	50	215	201	278	831
Developing countries	517	1,732	5,951	146	857	3,132
Asia	343	1,073	3,663	67	608	2,276
Hong Kong (China)	202	455	1,098	12	388	948
China	21	193	579	4	28	298
Singapore	30	111	470	8	57	300
Latin America and Caribbean	111	502	1,473	58	205	733
Brazil	37	122	473	41	52	181
Mexico	22	97	327	3	8	66
Southeast Europe and CIS	0	61	688	0	21	473
Russia	0	32	423	0	20	434
Poland	0	34	193	0	1	37
Africa	61	154	554	20	44	122
South Africa	9	43	132	15	32	81
World	2,081	7,446	19,141	2,094	7,962	20,408

[a]U.S. values differ a little from those in Tables 12.1 to 12.3 because of different data collection methods.
Source: United Nations Conference on Trade and Development, *World Investment Report* (Geneva: United Nations, 2011).

12.4A Effects on the Investing and Host Countries

In Figure 12.1, we examine a world of only two nations (Nation 1 and Nation 2) with a total combined capital stock of OO'. Of this total capital stock, OA belongs to Nation 1 and $O'A$ belongs to Nation 2. The $VMPK_1$ and $VMPK_2$ curves give the value of the marginal product of capital in Nation 1 and Nation 2, respectively, for various levels of investments. Under competitive conditions, the value of the marginal product of capital represents the return, or yield, on capital.

In isolation, Nation 1 invests its entire capital stock OA domestically at a yield of OC. The total product (which can be measured by the area under the value of the marginal product curve) is thus $OFGA$, of which $OCGA$ goes to owners of capital in Nation 1 and the remainder of CFG goes to other cooperating factors, such as labor and land. Similarly,

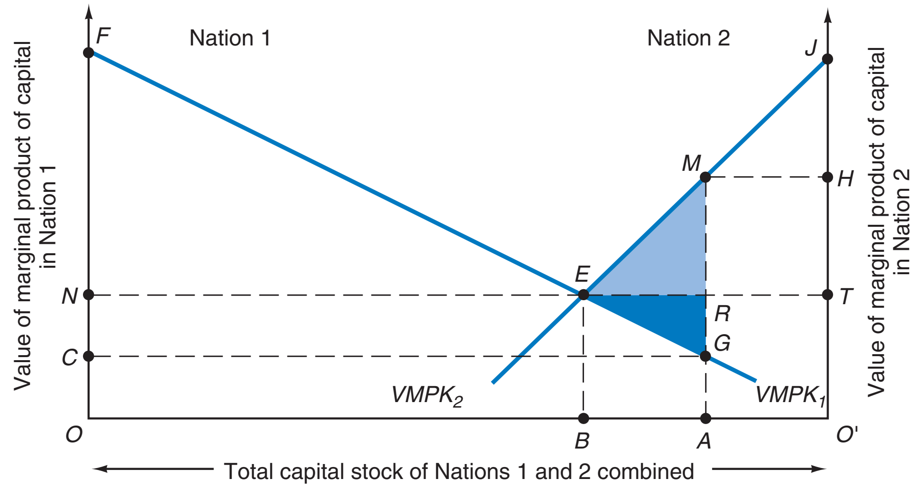

FIGURE 12.1. Output and Welfare Effects of International Capital Transfers. Of the total capital stock of *OO′*, Nation 1 holds *OA* and its total output is *OFGA*, while Nation 2 holds *O′A* and its total output is *O′JMA*. The transfer of *AB* of capital from Nation 1 to Nation 2 equalizes the return on capital in the two nations at *BE*. This increases world output by *EGM* (the shaded area), of which *EGR* accrues to Nation 1 and *ERM* to Nation 2. Of the increase in total domestic product of *ABEM* in Nation 2, *ABER* goes to foreign investors, leaving *ERM* as the net gain in domestic income in Nation 2.

Nation 2 in isolation invests its entire stock $O'A$ domestically at a yield of $O'H$. Total product is $O'JMA$, of which $O'HMA$ goes to owners of capital in Nation 2 and the remainder of HJM goes to other cooperating factors.

Let us assume that free international capital movements are allowed. Since the return on capital is higher in Nation 2 $(O'H)$ than in Nation 1 (OC), AB of capital flows from Nation 1 to Nation 2 so as to equalize at BE $(= ON = O'T)$ the rate of return on capital in the two nations. Total *domestic product* in Nation 1 is now $OFEB$, to which must be added $ABER$ as the total return on foreign investments, giving a total *national income* of $OFERA$ (ERG greater than before foreign investments). With free international capital flows, the total return on capital in Nation 1 increases to $ONRA$, while the total return on other cooperating factors decreases to NFE.

The inflow of AB of foreign capital into Nation 2 lowers the rate of return on capital from $O'H$ to $O'T$. Total domestic product in Nation 2 grows from $O'JMA$ to $O'JEB$. Of the increase in total product of $ABEM$, $ABER$ goes to foreign investors, so that ERM remains as the *net gain* in total product accruing to Nation 2. The total return to domestic owners of capital falls from $O'HMA$ to $O'TRA$, while the total return to other cooperating factors rises from HJM to TJE.

From the point of view of the world as a whole (i.e., the two nations combined), total product increased from $OFGA + O'JMA$ to $OFEB + O'JEB$, or by $ERG + ERM = EGM$ (the shaded area of the figure). Thus, international capital flows increase the efficiency in the allocation of resources internationally and increase world output and welfare. Note that the steeper the $VMPK_1$ and $VMPK_2$ curves are, the greater is the total gain from international capital flows.

12.4B Other Effects on the Investing and Host Countries

Assuming two factors of production, capital and labor, both fully employed before and after the capital transfer, it can be seen from Figure 12.1 that the total and average return on capital increases, whereas the total and average return to labor decreases in the investing country. Thus, while the investing country as a whole gains from investing abroad, there is a redistribution of domestic income from labor to capital. It is for this reason that organized labor in the United States is opposed to U.S. investments abroad. On the other hand, while the host country also gains from receiving foreign investments, these investments lead to a redistribution of domestic income from capital to labor. If we allow for less than full employment, foreign investments tend to depress the level of employment in the investing country and increase it in the host country and, once again, can be expected to be opposed by labor in the former and to benefit labor in the latter.

International capital transfers also affect the balance of payments of the investing and host countries. A nation's balance of payments measures its total receipts from and total expenditures in the rest of the world. In the year in which the foreign investment takes place, the foreign expenditures of the investing country increase and cause a balance-of-payments deficit (an excess of expenditures abroad over foreign receipts). This was certainly a major contributor to the huge balance-of-payments deficits of the United States during the 1960s and led to restrictions on U.S. foreign investments from 1965 to 1974. Of course, the counterpart to the worsening in the investing nation's balance of payments is the improvement in the host nation's balance of payments in the year in which it receives the foreign investment.

The initial capital transfer and increased expenditures abroad of the investing country are likely to be mitigated by increased exports of capital goods, spare parts, and other products of the investing country, and by the subsequent flow of profits to the investing country. It has been estimated that the "payback" period for the initial capital transfer is between five and ten years on average. Another effect to consider in the long run is whether foreign investments will lead to the replacement of the investing country's exports and even to imports of commodities previously exported. Thus, while the immediate effect on the balance of payments is negative in the investing country and positive in the host country, the long-run effects are less certain.

Since foreign investments for most developed countries are two-way (see Section 12.2), these short-run and long-run balance-of-payments effects are mostly neutralized, except for the United Kingdom, the United States, Germany, and Japan, with investments abroad greatly exceeding foreign investments received, and for most developing countries that are primarily recipients of foreign investments and chronically face serious balance-of-payments difficulties (see Case Study 12-2).

Another important welfare effect of foreign investments on both the investing and host countries results from different rates of taxation and foreign earnings in various countries. Thus, if corporate taxes are 40 percent of earnings in the United States but only 30 percent in England, it is only natural for U.S. firms to invest in England or reroute foreign sales through subsidiaries there in order to pay the lower tax rate. Because most nations, including the United States, are signatories of double-taxation agreements (to avoid double taxation—on equity grounds), the United States would collect a tax of only 10 percent on foreign earnings (the difference between the domestic tax rate of 40 percent and the foreign tax rate of 30 percent) when foreign earnings are repatriated. As a result, the tax base and the amount of taxes collected decline in the investing country and rise in the host country.

Foreign investments, by affecting output and the volume of trade of both investing and host countries, are also likely to affect the terms of trade. However, the way the terms of trade will change depends on conditions in both nations, and not much can be said a priori. Foreign investments may also affect the investing nation's technological lead and the host country's control over its economy and ability to conduct its own independent economic policy. Since these and other effects of international capital transfers usually result from the operations of multinational corporations, they are examined in the next section.

12.5 Multinational Corporations

One of the most significant international economic developments of the postwar period is the proliferation of multinational corporations (MNCs). These are firms that own, control, or manage production facilities in several countries. Today MNCs account for about 25 percent of world output, and *intrafirm* trade (i.e., trade among the parent firm and its foreign affiliates) is estimated to be about one-third of total world trade in manufacturing. Some MNCs, such as General Motors and Exxon, are truly giants, with yearly sales in the tens of billions of dollars and exceeding the total national income of all but a handful of nations. Furthermore, most international direct investments today are undertaken by MNCs. In the process, the parent firm usually provides its foreign affiliates with managerial expertise, technology, parts, and a marketing organization in return for some of the affiliates' output and earnings. In this section, we examine the reasons for the existence of MNCs and some of the problems they create for the home and host countries.

12.5A Reasons for the Existence of Multinational Corporations

The basic reason for the existence of MNCs is the competitive advantage of a global network of production and distribution. This competitive advantage arises in part from vertical and horizontal integration with foreign affiliates. By vertical integration, most MNCs can ensure their supply of foreign raw materials and intermediate products and circumvent (with more efficient intrafirm trade) the imperfections often found in foreign markets. They can also provide better distribution and service networks. By horizontal integration through foreign affiliates, MNCs can better protect and exploit their monopoly power, adapt their products to local conditions and tastes, and ensure consistent product quality.

The competitive advantage of MNCs is also based on economies of scale in production, financing, research and development (R&D), and the gathering of market information. The large output of MNCs allows them to carry division of labor and specialization in production much further than smaller national firms. Product components requiring only unskilled labor can be produced in low-wage nations and shipped elsewhere for assembly. Furthermore, MNCs and their affiliates usually have greater access, at better terms, to international capital markets than do purely national firms, and this puts MNCs in a better position to finance large projects. They can also concentrate R&D in one or a few advanced nations best suited for these purposes because of the greater availability of technical personnel and facilities. Finally, foreign affiliates funnel information from around the world to the parent firm, placing it in a better position than national firms to evaluate, anticipate, and take advantage of changes in comparative costs, consumers' tastes, and market conditions generally.

The large corporation invests abroad when expected profits on additional investments in its industry are higher abroad. Since the corporation usually has a competitive advantage in and knows its industry best, it does not usually consider the possibility of higher returns in every other domestic industry before it decides to invest abroad. That is, differences in expected rates of profits domestically and abroad in the particular industry are of crucial importance in a large corporation's decision to invest abroad. This explains, for example, Toyota automotive investments in the United States and IBM computer investments in Japan. Indeed, it also explains investments of several Japanese electronics MNCs in the United States as an attempt to invade the latter's computer market. All of this information implies that MNCs are *oligopolists* selling for the most part *differentiated products*, often developed as described by the *technological gap* and *product cycle models*, and produced under strong *economies of scale* (see Section 6.5). Examples of the products sold by MNCs are motor vehicles, petroleum products, electronics, metals, office equipment, chemicals, and food.

Multinational corporations are also in a much better position to control or change to their advantage the environment in which they operate than are purely national firms. For example, in determining where to set up a plant to produce a component, an MNC can and usually does "shop around" for the low-wage nation that offers the most incentives in the form of tax holidays, subsidies, and other tax and trade benefits. The sheer size of most MNCs in relation to most host nations also means the MNCs are in a better position than purely national firms to influence the policies of local governments and extract benefits. Furthermore, MNCs can buy up promising local firms to avoid future competition and are in a much better position than purely domestic firms to engage in other practices that restrict local trade and increase their profits. MNCs, through greater diversification, also face lower risks and generally earn higher profits than purely national firms.

Finally, by artificially overpricing components shipped *to* an affiliate in a higher-tax nation and underpricing products shipped *from* the affiliate in the high-tax nation, an MNC can minimize its tax bill. This is called transfer pricing and can arise in intrafirm trade as opposed to trade among independent firms or conducted at "arm's length."

In the final analysis, it is a combination of all or most of these factors that gives MNCs their competitive advantage vis-à-vis purely national firms and explains the proliferation and great importance of MNCs today. That is, by vertical and horizontal integration with foreign affiliates, by taking advantage of economies of scale, and by being in a better position than purely national firms to control the environment in which they operate, MNCs have grown to become the most prominent form of private international economic organization in existence today. Case Study 12-3 examines the world's largest MNCs.

12.5B Problems Created by Multinational Corporations in the Home Country

While MNCs, by efficiently organizing production and distribution on a world wide basis, can increase world output and welfare, they can also create serious problems in both the home and host countries. The most controversial of the alleged harmful effects of MNCs on the home nation is the loss of domestic jobs resulting from foreign direct investments. These are likely to be unskilled and semiskilled production jobs in which the home nation has a comparative disadvantage. It is for this reason that organized labor in the United States and

CASE STUDY 12-3 The World's Largest Non-Petroleum, Industrial Corporations

Table 12.6 gives the home nation of the parent firm, the major industry, the level of yearly sales, and the percentage of those sales made outside the home country for the world's largest non-petroleum, industrial multinational corporations (MNCs) with 2012 sales in excess of $100 billion. From the table we see that six of these 14 MNCs have headquarters in the United States, four in Japan, three in Germany, and one in S. Korea. Seven are in motor vehicles, five in electronics and two in computers. Honda Motors had the highest percentage of foreign sales (81.3), and the simple average for all 14 firms was 65.0 percent.

TABLE 12.6. The World's Largest Industrial Multinational Corporations in 2007

Rank	Company	Home Nation	Industry	Yearly Sales (billion $)	Percentage of Foreign Sales*
1	Toyota	Japan	Motor vehicles	235.4	63.6
2	Volkswagen	Germany	Motor vehicles	221.6	75.7
3	General Motors	United States	Motor vehicles	150.3	49.4
4	Samsung	S.Korea	Electronics	148.9	80.6
5	Daimler	Germany	Motor vehicles	148.1	77.2
6	General Electric	United States	Electronics	147.6	53.3
7	Ford Motor	United States	Motor vehicles	136.3	58.7
8	Hewlett-Packard	United States	Electronics	127.2	68.8
9	Hitachi	Japan	Computers	122.4	33.2
10	Nissan Motor	Japan	Motor vehicles	119.2	72.4
11	Siemens	Germany	Electronics	113.3	72.6
12	Apple	United States	Electronics	108.2	58.0
13	IBM	United States	Computers	106.9	64.6
14	Honda Motor	Japan	Motor vehicles	100.7	81.3

** = 2008*

Sources: "The Global 500," Fortune Magazine, July 9, 2012, pp. F1-1–F7 and UNCTAD, *World Investment Report 2012* (New York and Geneva: UNCTAD, 2012).

other major home nations is against direct foreign investments by MNCs. However, some clerical, managerial, and technical jobs are also likely to be created in the headquarters of the MNC in the home nation as a result of direct foreign investments. Even if the number of jobs lost exceeds the number created, it may be that the home nation would have lost these jobs anyway to foreign competitors and would have had no jobs created at home without the direct foreign investment. The extent to which this may be true depends, of course, on the type of direct foreign investment and the circumstances under which it takes place. See Case Study 12-4 for the employment of workers abroad by U.S. MNCs.

A related problem is the export of advanced technology to be combined with other cheaper foreign factors to maximize corporate profits. It is claimed that this may undermine the technological superiority and future of the home nation. However, against this possible harmful effect is the tendency of MNCs to concentrate their R&D in the home nation, thus allowing it to maintain its technological lead. Whether or not MNCs, on balance, undermine

CASE STUDY 12-4 Employment of U.S. MNCs Abroad

Table 12.7 shows the number and percentage of workers employed abroad by U.S. multinational corporations in various nations in 2009. The table shows that U.S. MNCs employed almost 12 million workers abroad in 2009, of which 36.8 percent were in Europe, 32.6 percent in Asia and the Pacific, and 19.4 percent in Latin America and other countries of the Western Hemisphere. China, the United Kingdom, Mexico, and Canada had the largest number among industrial countries (with 11.1 percent, 10.3 percent, 9.1 percent, and 8.4 percent of the total, respectively). Note that foreign-based MNCs employed 5.3 million workers in the United States in 2009 and, as pointed out in section 9.8, not all jobs created abroad by U.S. MNCs come at the expense of domestic jobs in the United States.

TABLE 12.7. Number of Workers Employed Abroad by U.S. MNCs in 2009 (in Thousands)

Region/Country	Employment	Percentage of Total
Canada	1,094	8.4
Europe, of which:	4,775	36.8
United Kingdom	1,337	10.3
Germany	678	5.2
France	567	4.4
Asia and Pacific, of which:	4,219	32.6
China	1,433	11.1
Japan	612	4.7
India	601	4.6
Latin America and Other Western Hemisphere, of which:	2,519	19.4
Mexico	1,186	9.1
Brazil	546	4.2
Africa	228	1.8
Middle East	127	1.0
All Countries	*12,962*	*100.0*

Source: U.S. Department of Commerce, *Survey of Current Business*, November 2011, p. 51.

the technological superiority of the home country is a hotly debated question to which no clear-cut answer is yet possible.

Another possible harmful effect of MNCs on the home country can result from transfer pricing and similar practices, and from shifting their operations to lower-tax nations, which reduces tax revenues and erodes the tax base of the home country. This results from common international taxing practice. Specifically, the host country taxes the subsidiary's profits first. To avoid double taxation of foreign subsidiaries, the home country then usually taxes only repatriated profits (if its tax rate is higher than in the host country), and only by the difference in the tax rates.

An example will clarify this point. Suppose that the corporate profit tax is 50 percent in the home country and 40 percent in the host country, and the before-tax risk-adjusted profit rate is 20 percent abroad but 16 percent at home. The MNC will then invest abroad. When 20 percent is earned abroad, the host country gets 8 percent in taxes and the MNC retains 12 percent. When the MNC repatriates this 12 percent profit, the home country will tax it at the rate of 10 percent (the difference between the domestic and the foreign corporate tax profit rate). Thus, the home country gets only 1.2 percent and only when the profits are repatriated. The reinvestment of profits abroad in the MNC's affiliate thus amounts to an interest-free loan from the home country. If the corporate profit tax rates of the home and host countries were equal, the home country would collect no tax at all even when the MNC repatriates its profits. Had the MNC invested in the home country to begin with and earned a profit of 16 percent, the home country would have collected a tax of 8 percent (at the 50 percent tax rate). Thus, MNCs reduce tax revenues and erode the tax base of the home country.

Finally, because of their access to international capital markets, MNCs can circumvent domestic monetary policies and make government control over the economy in the home nation more difficult. These alleged harmful effects of MNCs are of crucial importance to the United States, since it is home for about one-third of the largest MNCs. In general, home nations do impose some restrictions on the activities of MNCs, either for balance-of-payments reasons or, more recently, for employment reasons.

12.5c Problems Created by Multinational Corporations in the Host Country

Host countries have even more serious complaints against MNCs. First and foremost is the allegation that MNCs dominate their economies. This is certainly true for Canada, where almost 60 percent of the total capital in manufacturing is owned or controlled by foreigners (40 percent by Americans). It is also true for some of the smaller developing nations. Foreign domination is felt in many different ways in host countries, including (1) the unwillingness of a local affiliate of an MNC to export to a nation deemed unfriendly to the home nation or the requirement to comply with a *home-nation* law prohibiting such exports; (2) the borrowing of funds abroad to circumvent tight domestic credit conditions and the lending of funds abroad when interest rates are low at home; and (3) the effect on national tastes of large-scale advertising for such products as Coca-Cola, jeans, and so on.

Another alleged harmful effect of MNCs on the host country is the siphoning off of R&D funds to the home nation. While this may be more efficient for the MNC and the world as a whole, it also keeps the host country technologically dependent. This is especially true and serious for developing nations. Also, MNCs may absorb local savings and entrepreneurial talent, thus preventing them from being used to establish domestic enterprises that might be more important for national growth and development. The extent to which this occurs, however, is not clear. Multinational corporations may also extract from host nations most of the benefits resulting from their investments, either through tax and tariff benefits or through tax avoidance. In developing nations, foreign direct investments by MNCs in mineral and raw material production have often given rise to complaints of foreign exploitation in the form of low prices paid to host nations, the use of highly capital-intensive production techniques inappropriate for labor-abundant developing nations, lack of training of local labor, overexploitation of natural resources, and creating highly dualistic "enclave" economies.

Most of these complaints are to some extent true, particularly in the case of developing host countries, and they have led many host nations to regulate foreign investments in order to mitigate the harmful effects and increase the possible benefits. Thus, Canada imposed higher taxes on foreign affiliates with less than 25 percent Canadian interest. India specified the sectors in which direct foreign investments are allowed and set rules to regulate their operation. Some developing nations allow only *joint ventures* (i.e., local equity participation) and set rules for the transfer of technology and the training of domestic labor, impose limits on the use of imported inputs and the remission of profits, set environmental regulations, and so on. In the extreme, the host nation can nationalize foreign production facilities. However, this is likely to seriously reduce the future flow of direct foreign investments to the nation.

Even in the United States, the home of about a third of the largest MNCs, great concern was expressed over foreign control at the height of foreign direct investment flows during the late 1980s. This concern then vanished in the light of the sharp reduction in foreign direct investments in the early 1990s (see Case Study 12-1). Efforts are currently in progress within the EU, OECD, the UN, and UNCTAD to devise an international code of conduct for MNCs. However, since the interests of home and host countries are generally in conflict, it is virtually impossible for such an international code to be very specific. As a result, it is unlikely to succeed in severely restricting most of the abuses of and problems created by MNCs in home and host countries. The Uruguay Round eliminated only some of the domestic restrictions and regulations on FDI.

12.6 Motives for and Welfare Effects of International Labor Migration

Labor is generally less mobile internationally than capital. However, great waves of immigrants moved from Europe to the New World during the nineteenth century. This relieved population pressures in Europe and contributed significantly to the rapid growth and development of the New World, especially the United States. In this section, we examine the causes of international labor migration and analyze its welfare effects on the countries of emigration and immigration. Those effects that can be illustrated graphically are examined first. Subsequently, we examine the effects that are not apparent from the graphical analysis.

12.6A Motives for International Labor Migration

International labor migration can take place for economic as well as noneconomic reasons. Some of the international migrations that occurred in the nineteenth century and earlier were certainly motivated by the desire to escape political and religious oppression in Europe. However, most international labor migration, particularly since the end of World War II, has been motivated by the prospect of earning higher real wages and income abroad.

The decision to migrate for economic reasons can be analyzed in the same manner and with the same tools as any other investment decision. Specifically, migration, just like any other type of investment, involves both costs and benefits. The costs include the expenditures for transportation and the loss of wages during time spent relocating and searching for a job in the new nation. In addition, there are many other less quantifiable costs, such as the separation from relatives, friends, and familiar surroundings; the need to learn new customs and often a new language; and the risks involved in finding a job, housing, and so on in a new land. To be sure, many of these noneconomic costs are greatly reduced by the fact that migrations usually occur in waves and in chains, with many migrants moving together and/or to areas with an already substantial number of earlier migrants from the same place of origin.

The economic benefits of international migration can be measured by the higher real wages and income that the migrant worker can earn abroad during his or her remaining working life, over and above what he or she could have earned at home. Other benefits may be greater educational and job opportunities for the migrants' children. From the excess of returns over costs, an internal rate of return for the migration decision can be estimated, just as for any other type of investment. If this rate of return is sufficiently high to also overcome the noneconomic costs associated with migration, then the worker will migrate. Of course, in the real world workers seldom, if ever, have the information to carry out this type of cost-benefit analysis explicitly. Nevertheless, they behave as if they did. This is confirmed by the fact that migrants invariably move from low-wage to high-wage nations. Furthermore, younger workers migrate more readily than older workers because, among other things, they have a longer remaining working life over which to benefit from the higher wages abroad.

12.6B Welfare Effects of International Labor Migration

The welfare effects of international labor migration on the nations of emigration and immigration can be analyzed with the same diagrammatic technique used to analyze the welfare effects of international capital movements. In Figure 12.2, the supply of labor is *OA* in Nation 1 and *O′A* in Nation 2. The $VMPL_1$ and $VMPL_2$ curves give the value of the marginal revenue product of labor in Nation 1 and Nation 2, respectively. Under competitive conditions, *VMPL* represents the real wages of labor.

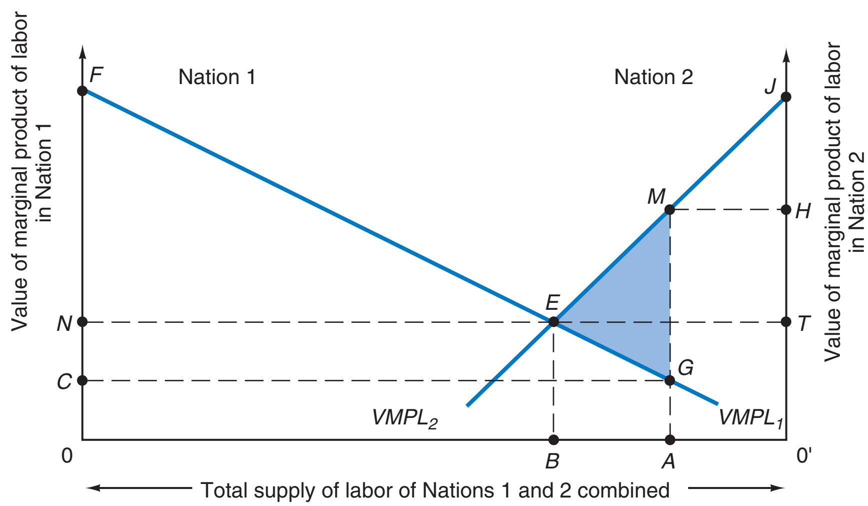

FIGURE 12.2. Output and Welfare Effects of International Labor Migration.
With a supply of labor of *OA*, Nation 1 has a real wage rate of *OC* and a total output of *OFGA*. With a supply of labor of *O′A*, Nation 2 has a real wage rate of *O′H* and a total output of *O′JMA*. The migration of *AB* of labor from Nation 1 to Nation 2 equalizes real wages in the two nations at *BE*. This reduces total output to *OFEB* in Nation 1 and increases it in Nation 2 to *O′JEB*, for a net increase in world output of *EGM* (the shaded area).

Before migration, the wage rate is OC and total product is $OFGA$ in Nation 1. In Nation 2, the wage rate is $O'H$ and total product is $O'JMA$. Now let us assume free international labor migration. Since wages are higher in Nation 2 ($O'H$) than in Nation 1 (OC), AB of labor migrates from Nation 1 to Nation 2 so as to equalize wages in the two nations at BE ($= ON = O'T$). Thus, wages rise in Nation 1 and fall in Nation 2 (and for that reason immigration is generally opposed by organized labor). On the other hand, total product falls from $OFGA$ to $OFEB$ in Nation 1 and rises from $O'JMA$ to $O'JEB$ in Nation 2, for a net gain in world output of EGM (the shaded area in the figure). Note that there is a redistribution of national income toward labor in Nation 1 (the nation of emigration) and toward nonlabor resources in Nation 2. Nation 1 may also receive some remittances from its migrant workers. Note also that if AB of labor had been unemployed in Nation 1 before migration, the wage rate would have been ON and the total product $OFEB$ in Nation 1 with and without migration, and the net increase in world output with migration would have been $ABEM$ (all accruing to Nation 2).

12.6c Other Welfare Effects of International Labor Migration

So far, we have implicitly assumed that all labor is unskilled. However, even casual observation of the real world reveals a great variety in the quality and amount of human capital (in the form of education, training, and health) embodied in different workers and labor groups. The question then arises as to the welfare effects of the migration of a highly skilled worker on the nations of emigration and immigration. These welfare effects are likely to be significantly different from those arising from the migration of unskilled labor. Concern with this question has greatly increased since the 1950s and 1960s as relatively large numbers of scientists and technicians, doctors and nurses, and other highly skilled personnel have moved from developing to developed nations and from Europe to the United States. For example, of the 8.7 million people that poured into the United States from the rest of the world during the 1980s, 1.5 million were college educated. More than 40 percent of the 200 researchers in the Communications Sciences Research wing at AT&T Bell Laboratories were foreign born, and more than 50 percent of science and engineering doctorates awarded by U.S. universities now go to foreign-born students—many of whom remain in the United States. Indeed, more and more U.S. high-tech industries, from semiconductors to biotechnology, are depending on immigrant scientists and engineers to remain competitive in the increasingly global marketplace. The problem of the migration of highly skilled workers is vividly conveyed by the term brain drain.

The nations of origin of skilled migrants charge that they incur a great cost in educating and training these workers, only to see them leave and benefit the receiving nations. To be sure, many of these highly skilled workers often cannot be used effectively at home—as, for example, when a doctor only performs nursing services and engineers are used as technicians, as frequently happens in some developing countries. Nevertheless, the fact remains that the nation of origin incurs the great expense of training these workers but receives only emigrant remittance (which, however, in 2010 was $325 billion as compared with $128 billion in foreign aid). It may also be that more dynamic, more alert, and younger workers emigrate, thus reducing the stock of those qualities in the remaining labor force.

The brain drain is often encouraged by national immigration laws (as in the United States, the United Kingdom, and other industrial nations) that facilitate the immigration of skilled persons but generally impose serious obstacles to the immigration of unskilled workers. This has led to demands to tax skilled emigrants at the time of exit or tax their subsequent higher earnings in the nation of immigration, so that the nation of origin could recoup part of the cost incurred in training them. Although these proposals seem reasonable, it must be remembered that an important element of personal freedom is involved in the ability to migrate. Thus, it might be more acceptable from the individual's point of view and more efficient from an economic point of view for the government of the receiving nation to somehow compensate, through increased aid or other financial transfer to the nation of origin, for the training costs of skilled immigrants, particularly if the nation of origin is a developing nation.

In the preceding discussion of the migration of skilled and unskilled workers, we implicitly assumed that the migration decision is more or less permanent. However, a great deal of labor migration, particularly into the European Union, has been of a temporary type. That is, a nation such as Germany admitted foreign workers on a temporary basis when needed (the so-called guest workers), but refused to renew work permits during domestic economic downturns when the foreign workers were no longer needed. By doing so, Germany more or less insulated its economy and its labor force from economic downturns and imposed the adjustment problem on sending nations such as Turkey, Algeria, and Egypt, which are poorer and less capable of dealing effectively with the resulting unemployment.

In 2010, immigrants represented 26.5 percent of the *labor force* of Australia, 26.3 percent of that of Switzerland, 19.6 percent of Canada, 14.3 percent of Spain, 12.9 of Germany, 12.5 percent of the United States, 11.6 percent of France, and 11.3 percent of the United Kingdom. Case Study 9-5 provides historical data on U.S. immigration and summarizes the debate over immigration policy. In recent years and in the face of high rates of unemployment in many industrial nations, particularly in Europe, temporary migrants have been made to feel increasingly unwelcome and have encountered rising discrimination, even in nations such as France and England that usually welcomed them. Their work permits have not been renewed, and they have been encouraged to return home. Nevertheless, their numbers and proportion of the total labor force in most receiving nations continued to increase.

There is then the problem of illegal migration. This has been a burning issue in the United States, where millions of illegal migrants work in the so-called underground economy at below minimum wages and with few if any social benefits. Illegal migration significantly affects income distribution in the United States by depressing the income of low-skill American workers. This has given rise to vigorous debates in the United States on how to deal with the problem and how to stop or slow down the flood of illegal migrants. It was estimated that there were 10.8 million illegal migrants in the United States in 2010. Of these, about 7 million were workers, which represented about 5 percent of the U.S. labor force. Only with the economic crisis and high rate of unemployment in 2009–2011 did the flood of illegal immigration to the United States slowed down significantly.

In 1986, the United States passed the *Immigration Reform and Control Act of 1986,* which provided (1) amnesty and the possibility to acquire legal residence and eventual citizenship to illegal aliens who could demonstrate that they had resided in the United States continuously since before January 1, 1982, and (2) fines for employers ranging from $250 to $10,000 for each illegal alien that they hired. By 2010, less than a quarter of illegal aliens had applied for legal status. In 2004, President Bush proposed a plan that would allow millions of illegal workers to get temporary legal status along with many of the benefits of citizenship. Case Study 12-5 provides historical data on U.S. immigration and summarizes the debate over immigration policy.

CASE STUDY 12-5 U.S. Immigration and Debate over Immigration Policy

Table 12.8 shows the number of people immigrating to the United States and their percentage of the U.S. population for each decade from 1901 to 2010. The table shows that the number of immigrants into the United States reached almost 9 million, representing over 10 percent of the U.S. population in the 1901–1910 decade. It fell drastically during the 1931–1940 decade because of the Great Depression and the outbreak of World War II. Immigration rose again after World War II, surpassed after World War II, and was 10.5 million in the 2000–2010 decade (but which represented only 3.5 percent of the U.S. population because of the rapid growth during the past century).

In 2010, 38.5 million Americans, or 12.5 percent of the U.S. population, were born elsewhere. This was higher than in any other year since World War II (the all-time high was 14.7 percent in 1910). Illegal immigrants (10.8 million) were 28.1 percent of the total. The rapid increase in immigration (legal and illegal) in recent years led to an intense national debate on the nation's immigration policy.

The immigration of highly trained individuals and bright students coming to the United States to get higher degrees and then remaining is clearly of great benefit to the United States. Less clear is the case for immigration of uneducated and unskilled people. The U.S. Census data indicate that nearly 21 percent of recent immigrants over the age of 25 have bachelor's degrees (as compared with about 15 percent for native Americans), but 31 percent do not have a high school diploma (as compared with 8 percent of U.S.-born population). Thus, the majority of recent immigrants are either very educated or have little education.

TABLE 12.8. U.S. Immigration, 1901–2012

	Total	
Years	Number	Rate*
1901–1910	8, 795	10.4
1911–1920	5, 736	5.7
1921–1930	4, 107	3.5
1931–1940	528	0.4
1941–1950	1, 035	0.7
1951–1960	2, 515	1.5
1961–1970	3, 322	1.7
1971–1980	4, 499	2.0
1981–1990	7, 256	3.0
1991–2000	9, 081	3.4
2001–2010	10, 501	3.5

*Per 1,000 of U.S. population

Source: U.S. Statistical Abstract, 2012, Table 43.

In general, immigration is good for the country. But, at least in the short run, native workers receive lower wages than without immigration, whereas employers gain by being able to pay lower wages. This explains why labor is generally opposed to immigration while business favors it. *Borjas* estimated that for every 10 percent increase in the supply of foreign workers, the wage of competing U.S. workers is reduced by 3 or 4 percent.

In 1990, the H1-B visa program was established, which allowed each year up to 65,000 educated foreigners to fill specialized American jobs, largely in the high-tech industry, for a period of six years (but requiring renewal after the first three years) if an employer petitions the U.S. Immigration and Naturalization Service on their behalf. The number of H1-B visas was raised to 115,000 in 1998 and to 195,000 in 2001, but it was then scaled back to 65,000 in 2004. Since then, legislation has been under consideration in the U.S. Congress to sharply increase the number of such visas. An additional 20,000 are admitted under the advanced degree program for applicants who have obtained a U.S. master's degree or higher.

Sources: S. A. Camarota, *Immigrants in the United States, 2007* (Washington, D.C.: Center for Immigration Studies, November 2007); G. J. Borjas, "The Labor Market Impact of High Skill Immigration," *American Economic Review*, May 2005, pp. 56–60; J-C. Dumont and G. Lemaitre, "Counting Immigrants and Expatriates in OECD Countries," *OECD Social, Employment, and Migration, Working Paper No. 25*, 2004; "Talent Shortage Prompts US Calls for Visa Reforms," *Financial Times*, May 11, 2007, p. 5; and U.S. Citizenship and Immigration Services, U.S. Department of Homeland Security, *H-1B Fiscal Year 2012*.

SUMMARY

1. In this chapter we examined the effects of international flows of capital, labor, and technology. In some ways, these are substitutes for international commodity trade. Portfolio investments, such as the purchase of stocks and bonds, are purely financial assets and take place primarily through banks and investment funds. Direct investments are real investments in factories, capital goods, land, and inventories where both capital and management are involved and the investor retains control over use of the invested capital. International direct investments are usually undertaken by multinational corporations.

2. U.S. private holdings of foreign long-term securities (stocks and bonds) and foreign private holdings of U.S. long-term securities increased sharply from 1950 to 2010. The same is true for foreign direct investments. From 1950 to 2010, the stock of U.S. direct investments in Europe grew much more rapidly than the stock of U.S. direct investments in Canada and Latin America. U.S. direct investments abroad and foreign direct investments in the United States in manufacturing, finance, and services grew much more rapidly than in petroleum. The surge in foreign direct investments in the United States during the second half of the 1990s did not cause as much concern as that of the second half of the 1980s and during the past decade.

3. The basic motives for international portfolio investments are yield maximization and risk diversification. The latter is also required to explain two-way capital movements. Direct foreign investments require additional explanations. These are (1) to exploit abroad some unique production knowledge or managerial skill (horizontal integration), (2) to gain control over a foreign source of a needed raw material or a foreign marketing outlet (vertical integration), (3) to avoid import tariffs and other trade restrictions and/or to take advantage of production subsidies, (4) to enter a foreign oligopolistic market, (5) to acquire a foreign firm in order to avoid future competition, or (6) because of the unique ability to obtain financing.

4. International capital transfers increase the national income of both the investing and host countries, but in the investing nation the relative share going to capital rises and the share going to labor falls, while the opposite occurs in the host or receiving nation. Thus, the level of employment tends to fall in the investing nation and rise in the host nation. In the short run, the balance of payments tends to worsen in the investing nation and improve in the host nation. In the long run, the balance-of-payments effects of foreign investments on the investing and host nations are less clear-cut. Nations with high corporate tax rates encourage investments abroad and thereby lose tax revenues. The terms of trade are also likely to be affected by foreign investments.

5. Multinational corporations have grown to be the most prominent form of private international economic organization today. The basic reason for their existence is the competitive advantage of a global network of production and distribution. Some of the alleged problems created by multinational corporations in the home country are the export of domestic jobs, erosion of the home nation's technological advantage, avoidance of domestic taxes through transfer pricing, and reduced government control over the domestic economy. On the other hand, host countries complain of loss of sovereignty and domestic research activity, tax avoidance, inappropriate technology, and most benefits flowing to the home nation. As a result, most host nations have adopted policies to reduce these alleged harmful effects and increase the possible benefits.

6. International labor migration can occur for economic and noneconomic reasons. When the decision to migrate is economic, it can be evaluated in terms of costs and benefits just as any other investment in human and physical capital. International migration reduces total output and increases real wages in the nation of emigration while it increases total output and reduces real wages in the nation of immigration. These changes are accompanied by a net increase in world output. The migration of highly skilled and trained people confers special benefits on the nation of immigration and imposes serious burdens, in the form of sunk and replacement costs, on the nation of emigration. This problem is referred to as the brain drain.

A LOOK AHEAD

This chapter completes Part Two, dealing with international trade policies and resource movements. We next move on to Parts Three and Four, in which we will be discussing the monetary sector, or international finance. In Part Three, Chapter 13 deals with the balance of payments, Chapter 14 examines the operation of foreign exchange markets, and Chapter 15 presents monetary theories of exchange rate determination.

KEY TERMS

Brain drain, p. 385
Direct investments, p. 368
Horizontal integration, p. 373
Multinational corporations (MNCs), p. 378
Portfolio investments, p. 368
Portfolio theory, p. 372
Risk diversification, p. 372
Transfer pricing, p. 379
Vertical integration, p. 373

QUESTIONS FOR REVIEW

1. In what sense are international flows of productive resources a substitute for international commodity trade?

2. What is meant by portfolio investments? Through what institutions do they usually take place?

3. What is meant by direct investments? By what organizations are they usually undertaken internationally?

4. What was the dollar value of U.S. direct investments abroad and U.S. private holdings of long-term foreign securities in 1950 and 2007?

5. How were U.S. foreign direct investments in 2010 distributed among Europe, Canada, Latin America, and elsewhere? How much of U.S. foreign direct investments in 2010 went into manufacturing, finance, petroleum, and other activities? Answer the same questions for foreign investments in the United States.

6. What are the basic motives for international portfolio investments? What additional reasons are required to explain direct foreign investments?

7. How can two-way international capital investments be explained? What is meant by risk diversification? horizontal integration? vertical integration?

8. What is the effect of foreign investments on the national income of the investing and host nations? What is the effect on the relative share of national income going to capital and labor in each nation?

9. What is the effect of foreign investments on the balance of payments of the investing and host nations in the short run and in the long run? What problems do nations with high corporate tax rates face?

10. What is the importance of multinational corporations today? What are the reasons for their existence?

11. What are some of the problems created by multinational corporations in the home country? in the host country?

12. How have host countries attempted to limit the alleged harmful effects and increase the beneficial effects of multinational corporations?

13. What are the motives for the international migration of workers? What is the effect of labor migration on real wages, total output, and the relative share of national income going to labor in the nation of emigration and the nation of immigration?

14. What is meant by the brain drain? Why is it a problem? How can it be overcome?

PROBLEMS

1. On a set of price–quantity axes show the effect of a capital outflow on the investing country.
2. On a set of price–quantity axes show the effect of a capital inflow on the host or receiving country.
3. Update Table 12.1 for the most recent year for which data are available.
4. Update Table 12.2 for the most recent year for which data are available.
5. Update Table 12.3 for the most recent year for which data are available.
6. Update Table 12.4 for the most recent year for which data are available.

*7. Determine whether the following statement is true or false and explain why: "The profitability of a portfolio of many securities can never exceed the yield of the highest-yield security in the portfolio, but it can have a risk lower than the lowest-risk security."

8. Draw a figure similar to Figure 12.2 showing equal gains in two nations as a result of capital transfers from Nation 1 to Nation 2.
9. Draw a figure similar to Figure 12.2 showing greater gains for Nation 1 than for Nation 2 resulting from capital transfers from Nation 1 to Nation 2.
10. What general principle can you deduce from your answer to the previous two problems and from Figure 12.1 as to the distribution of the total gains from international capital transfers between the investing and the host nation?
11. Explain why the rate of return on U.S. direct investment in developing nations often exceeds the rate of return on investment on U.S. direct investments in developed nations.

*12. Using Figure 12.2, explain why organized labor in the United States opposes U.S. investments abroad.

*13. Using Figure 12.2, explain why labor in developing nations benefits from an inflow of foreign investments.

14. Update Table 12.6 for the most recent year for which data are available. How has the ranking of the world's largest MNCs changed since 2010?

*= Answer provided at www.wiley.com/college/salvatore.

APPENDIX

A12.1 The Transfer Problem

To be successful, any international long-term capital movement must be accompanied by a transfer of real resources from the investing or lending country to the host or borrowing country. For example, if a nation invests $100 million in another country, the investing nation must free real domestic resources and increase its exports to the host or receiving nation by $100 million in order for the international capital transfer to actually take place. Precisely how this transfer of real resources occurs is discussed in detail in Section A17.2 in connection with the income adjustment mechanism to correct balance-of-payments disequilibria. At this point, all that needs to be remembered is that a transfer of real resources must accompany any international transfer of financial resources in order for the latter to actually occur. This is known as the *transfer problem*.

A transfer problem arises not only in the case of international capital movements but also in connection with reparations payments for war damages. Examples of these are the indemnities that France was made to pay to Prussia after the 1870–1871 war and those that Germany had to pay to France after World War I. A more recent example is the transfer problem that arose from the sharp increase in petroleum prices during the 1970s. Most petroleum-exporting nations, notably Saudi Arabia, Libya, and Kuwait, did not spend all of their petroleum earnings on increased imports from petroleum-importing countries. Most unspent earnings were used for portfolio purchases in developed nations, especially in the United States. To the extent that not all excess earnings were so used, a deflationary tendency arose in the world economy as petroleum-importing nations tried to reduce their collective import surplus. Thus, a transfer problem was at the heart of the petroleum crisis during the 1970s.

Of more immediate interest is the transfer problem arising from the huge net foreign investments in the United States during the 1980s, which resulted in the United States joining the ranks of the debtor nations after 1985 for the first time since 1914. The counterpart to these huge net capital flows to the United States was the record trade deficits of the United States by which the transfer of real resources was accomplished (see Sections 13.6 and A17.2).

Problem For the period from 1973 to 1980 (the time of the petroleum crisis), construct a table showing (a) the dollar price per barrel of Saudi Arabian petroleum exports, (b) the dollar value of the total exports of the nations belonging to the Organization of Petroleum Exporting Countries (OPEC), (c) the dollar value of the total imports of OPEC, and (d) the dollar value of U.S. petroleum imports. (*Hint*: Consult the 1981 issue of *International Financial Statistics*, published by the International Monetary Fund, in your library.)

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http://www.unctad.org and click on *World Investment Report*.

http://www.oecd.org and click on *International Investment Statistics Yearbook*.

http://bea.doc.gov and click on *Survey of Current Business,* July issue.

For articles on transfer pricing:

http://www.oecd.org and click transfer pricing

http://www.econ.iastate.edu/classes/econ355/choi/mnc.htm

Information on immigration to the United States is found on the website of the U.S. Citizenship and Immigration Service (INS) at:

http://uscis.gov

part

3

The Balance of Payments, Foreign Exchange Markets, and Exchange Rates

Part Three (Chapters 13, 14, and 15) deals with balance of payments, foreign exchange markets, and exchange rate determination. A clear grasp of the material in these three chapters is crucial for understanding Part Four, which covers adjustment to balance-of-payments disequilibria, open-economy macroeconomics, and the functioning of the present international monetary system. Chapter 13 examines the meaning, function, and measurement of the balance of payments and defines the concepts of deficit and surplus in a nation's balance of payments. Besides presenting the theory, Chapter 14 also examines the actual operation of foreign exchange markets; therefore, it is of great practical relevance for all students of international economics, particularly business majors. Chapter 15 then deals with modern exchange rate theories and exchange rate determination based on the monetary and the asset market approach to the balance of payments.

Balance of Payments

chapter 13

LEARNING GOALS:

After reading this chapter, you should be able to:

- **Understand what the balance of payments is and what it measures**
- **Describe the change in the U.S. balance of payments over the years**
- **Understand the importance of the serious deterioration of the trade balance and net international investment position of the United States in recent years**

13.1 Introduction

In Parts One and Two, we dealt with the "real," as opposed to the monetary, side of the economy. Money was not explicitly considered, and the discussion was in terms of relative commodity prices. We now begin our examination of the monetary aspects of international economics, or international finance. Here, money is explicitly brought into the picture, and commodity prices are expressed in terms of domestic and foreign currency units. We begin our discussion of international finance by examining the balance of payments.

The balance of payments is a summary statement in which, in principle, all the transactions of the residents of a nation with the residents of all other nations are recorded during a particular period of time, usually a calendar year. The United States and some other nations also keep such a record on a quarterly basis. The main purpose of the balance of payments is to inform the government of the international position of the nation and to help it in its formulation of monetary, fiscal, and trade policies. Governments also regularly consult the balance of payments of important trade partners in making policy decisions. The information contained in a nation's balance of payments is also indispensable to banks, firms, and individuals directly or indirectly involved in international trade and finance.

The definition of the balance of payments just given requires some clarification. First of all, it is obvious that the literally millions of transactions of the residents of a nation with the rest of the world cannot appear *individually* in the balance of payments. As a *summary statement*, the balance of payments aggregates all merchandise trade into a few major categories. Similarly, only the net balance of each type of international capital flow is included. Furthermore, the balance of payments includes some transactions in which the residents of foreign nations are not directly involved—for example, when a nation's central bank sells a portion of its foreign currency holdings to the nation's commercial banks.

An *international transaction* refers to the exchange of a good, service, or asset (for which payment is usually required) between the residents of one nation and the residents of other nations. However, gifts and certain other transfers (for which no payment is required) are also included in a nation's balance of payments. The question of who is a *resident* of a nation also requires some clarification. Diplomats, military personnel, tourists, and workers who temporarily migrate are residents of the nation in which they hold citizenship. Similarly, a corporation is the resident of the nation in which it is incorporated, but its foreign branches and subsidiaries are not. Some of these distinctions are, of course, arbitrary and may lead to difficulties. For example, a worker may start by emigrating temporarily and then decide to remain abroad permanently. International institutions such as the United Nations, the International Monetary Fund (IMF), the World Bank, and the World Trade Organization (WTO) are not residents of the nation in which they are located. Also to be remembered is that the balance of payments has a time dimension. Thus, it is the flow of goods, services, gifts, and assets between the residents of a nation and the residents of other nations *during a particular period of time*, usually a calendar year.

In this chapter, we examine the international transactions of the United States and other nations. In Section 13.2, we discuss some accounting principles used in the presentation of the balance of payments. In Section 13.3, we present and analyze the international transactions of the United States for the year 2011. Section 13.4 then examines some accounting balances and the concept and measurement of balance-of-payments disequilibrium. Section 13.5 briefly reviews the postwar balance-of-payments history of the United States. Section 13.6 then examines the international investment position of the United States. The appendix presents the method of measuring the balance of payments that all nations must use in reporting to the International Monetary Fund. This ensures consistency and permits international comparison of the balance of payments of different nations.

13.2 Balance-of-Payments Accounting Principles

In this section, we examine some balance-of-payments accounting principles as a necessary first step in the presentation of the international transactions of the United States. We begin with the distinction between credits and debits, and then we examine double-entry bookkeeping.

13.2A Credits and Debits

International transactions are classified as credits or debits. Credit transactions are those that involve the receipt of payments *from* foreigners. Debit transactions are those that involve the making of payments *to* foreigners. Credit transactions are entered with a positive sign, and debit transactions are entered with a negative sign in the nation's balance of payments.

Thus, the export of goods and services, unilateral transfers (gifts) received from foreigners, and capital inflows are entered as credits (+) because they involve the receipt of payments from foreigners. On the other hand, the import of goods and services, unilateral transfers or gifts made to foreigners, and capital outflows involve payments to foreigners and are entered as debits (–) in the nation's balance of payments.

Financial inflows can take either of two forms: an increase in foreign assets in the nation or a reduction in the nation's assets abroad. For example, when a U.K. resident purchases a U.S. stock, foreign assets in the United States increase. This is a capital inflow to the United States and is recorded as a credit in the U.S. balance of payments because it involves the receipt of a payment from a foreigner. A capital inflow can also take the form of a reduction in the nation's assets abroad. For example, when a U.S. resident sells a foreign stock, U.S. assets abroad decrease. This is a capital inflow to the United States (reversing the capital outflow that occurred when the U.S. resident purchased the foreign stock) and is recorded as a credit in the U.S. balance of payments because it too involves the receipt of a payment from foreigners.

The definition of capital inflows to the United States as increases in foreign assets in the United States or reductions in U.S. assets abroad can be confusing and is somewhat unfortunate, but this is the terminology actually used in all U.S. government publications. Confusion can be avoided by remembering that when a foreigner purchases a U.S. asset (an increase in foreign assets in the United States), this involves the receipt of a payment from foreigners. Therefore, it is a capital inflow, or credit. Similarly, when a U.S. resident sells a foreign asset (a reduction in U.S. assets abroad), this also involves a payment from foreigners; therefore, it too represents a capital inflow to the United States and a credit. Both an increase in foreign assets in the United States and a reduction in U.S. assets abroad are capital inflows, or credits, because they both involve the receipt of payment from foreigners.

On the other hand, financial outflows can take the form of either an increase in the nation's assets abroad or a reduction in foreign assets in the nation because both involve a payment to foreigners. For example, the purchase of a U.K. treasury bill by a U.S. resident increases U.S. assets abroad and is a debit because it involves a payment to foreigners. Similarly, the sale of its U.S. subsidiary by a German firm reduces foreign assets in the United States and is also a debit because it involves a payment to foreigners. (The student should study these definitions and examples carefully, since mastery of these important concepts is crucial to understanding what follows.)

To summarize, the export of goods and services, the receipt of unilateral transfers, and financial inflows are credits (+) because they all involve the receipt of payments from foreigners. On the other hand, the import of goods and services, unilateral transfers to foreigners, and financial outflows are debits (–) because they involve payments to foreigners.

13.2B Double-Entry Bookkeeping

In recording a nation's international transactions, the accounting procedure known as double-entry bookkeeping is used. This means that each international transaction is recorded twice, once as a credit and once as a debit of an equal amount. The reason for this is that in general every transaction has two sides. We sell something and we receive payment for it. We buy something and we have to pay for it.

For example, suppose that a U.S. firm exports \$500 of goods to be paid for in three months. The United States first credits goods exports for \$500 since this goods export will lead to the receipt of a payment from foreigners. *The payment itself* is then entered as a financial debit because it represents a financial outflow from the United States. That is, by agreeing to wait three months for payment, the U.S. exporter is extending credit to, and has acquired a claim on, the foreign importer. This is an increase in U.S. assets abroad and a debit. The entire transaction is entered as follows in the U.S. balance of payments:

	Credit (+)	Debit (−)
Goods exports	$500	
Financial outflow		$500

As another example of double-entry bookkeeping, suppose that a U.S. resident visits London and spends $200 on hotels, meals, and so on. The U.S. resident is purchasing travel services from foreigners requiring a payment. (This is similar to a U.S. import.) Thus, the U.S. debits travel services for $200. The payment itself is then entered as a credit because it represents an increase in foreign claims on the United States. Specifically, we can think of the $200 in British hands as "securities" giving the United Kingdom a claim on U.S. goods and services, equivalent to an increase in foreign assets in the United States. Therefore, it is a financial inflow to the United States recorded as a credit of $200. The entire transaction is entered as follows in the U.S. balance of payments:

	Credit (+)	Debit (−)
Travel services purchased from foreigners		$200
Financial inflow	$200	

As a third example, assume that the U.S. government gives a U.S. bank balance of $100 to the government of a developing nation as part of the U.S. aid program. The United States debits unilateral transfers for the $100 gift given (payment made) to foreigners. The payment itself is the U.S. bank balance given to the government of the developing nation. This represents an increase in foreign claims on, or foreign assets in, the United States and is recorded as a financial inflow, or credit, in the U.S. balance of payments. The entire transaction is thus:

	Credit (+)	Debit (−)
Unilateral transfers made		$100
Financial inflow	$100	

As a fourth example, suppose that a U.S. resident purchases a foreign stock for $400 and pays for it by increasing *foreign* bank balances in the United States. The purchase of the foreign stock increases U.S. assets abroad. This is a financial outflow from the United States and is recorded as a financial debit of $400 in the U.S. balance of payments. The increase in foreign bank balances in the United States is an increase in foreign assets in the United States (a financial inflow to the United States) and is entered as a credit in the U.S. balance of payments. The result would be the same if the U.S. resident paid for the foreign stock by reducing bank balances abroad. (This would be a reduction in U.S. assets abroad, which is also a financial inflow to the United States and a credit.) Note that both sides of this transaction are financial:

	Credit (+)	Debit (−)
Financial outflow (the purchase of the foreign stock by the U.S. resident)		$400
Financial inflow (the increase in foreign bank balances in the U.S.)	$400	

Finally, suppose that a foreign investor purchases $300 of U.S. treasury bills and pays by drawing down his bank balances in the United States by an equal amount. The purchase of the U.S. treasury bills increases foreign assets in the United States. This is a financial inflow to the United States and is recorded as a credit in the U.S. balance of payments. The drawing down of U.S. bank balances by the foreigner is a reduction in foreign assets in the United States. This is a financial outflow from the United States and is recorded as such in the U.S. balance of payments:

	Credit (+)	Debit (−)
Financial inflow (the purchase of U.S. treasury bills by a foreigner)	$300	
Financial outflow (the reduction in foreign bank balances in the U.S.)		$300

If we assume that these five transactions are all the international transactions of the United States during the year, then the U.S. balance of payments is as follows:

	Credit (+)	Debit (−)
Goods	$500	
Services		$200
Unilateral transfers		100
Financial flows, net		200
Total debits and credits	$500	$500

The net capital debit balance of −$200 is obtained by adding together the seven capital entries (−$500, $200, $100, −$400, $400, $300, −$300) previously examined separately. Total debits equal total credits because of double-entry bookkeeping.

The traditional distinction between short-term capital and long-term financial transactions (i.e., with maturity of more than one year, such as a bond or a stock, as opposed to three-month treasury bills) is usually no longer made because bonds and stocks are liquid (i.e., can be sold and bought almost immediately).

13.3 The International Transactions of the United States

Table 13.1 presents a summary of the international transactions of the United States for the year 2011. In the table, credits are entered with positive signs and debits with negative signs. In a few instances, the sum of the subtotals differs slightly from the total because of rounding.

TABLE 13.1. Summary of U.S. International Transactions for 2011 (billions of dollars)

Current Account	Credits	Debits
Exports of goods, services, and income	+2, 848	
Goods	+1, 497	
Services	+606	
Income receipts on U.S. assets abroad	+745	
Imports of goods, services, and income		−3,181
Goods		−2,236
Services		−427
Income payments on foreign assets in the U.S.		−518
Unilateral transfers, net		−133
U.S. government grants		−47
U.S. government pensions and other transfers		−9
Private remittances and other transfers		−77
Capital Account		
Capital Account transactions, net		−1
Financial Account		
U.S.-owned assets abroad, excluding financial derivatives (increase/financial outflow (−))		-484
U.S. official reserve assets		−16
U.S. government assets, other than official reserve assets		−104
U.S. private assets		−364
Direct investment		−419
Foreign securities		−147
Nonbank claims		−12
Bank claims	+214	
Foreign-owned assets in the U.S., excluding financial derivatives (increase/financial inflow (+))	+1, 001	
Foreign official assets in the U.S.	+212	
Other foreign assets in the U.S.	+789	
Direct investment in the U.S.	+234	
U.S. treasury securities	+241	
U.S. securities other than U.S. treasury securities		−56
U.S. currency	+55	
Nonbank liabilities	+7	
Bank liabilities	−309	
Financial derivatives, net	+39	
Statistical discrepancy		−89
Memoranda		
Balance of goods trade		−738
Balance on services	+179	
Balance on goods and services		−560
Balance on income	+227	
Balance on goods, services, and income		−333
Unilateral current transfers, net		−133
Balance on current account		−466

Source: U.S. Department of Commerce, *Survey of Current Business* (Washington, D.C.: U.S. Government Printing Office, July 2012), pp. 58–59.

Table 13.1 shows that the United States exported $2,848 billion of goods and services (including the income receipts on U.S. assets abroad) in 2011. Goods exports of $1,497 billion included automobiles, petroleum products, chemicals, agricultural food products, computers, and electrical generating machinery (see Case Study 13-1). Service exports of $606 billion included travel and transportation services provided to foreigners, as well as fees and royalties received from foreigners. U. S. residents also earned $745 billion in interest and dividends on their foreign investments. Note that while a foreign investment or financial outflow from the United States is recorded as a debit under financial transactions (an increase in U.S.-owned assets abroad), the earnings from the services of U.S. assets abroad (foreign investments) are recorded here with the export of other services. The income receipts on U.S. assets abroad are recorded separately from other services because of their importance.

CASE STUDY 13-1 The Major Goods Exports and Imports of the United States

Table 13.2 shows the value of the major goods exported and imported by the United States in 2011. The major U.S. exports were automobiles, petroleum products, chemicals, agricultural food products, computers, and electrical generating machinery. U.S. imports were dominated by petroleum, automobiles, household appliances, apparel and household goods, computers, and medical products. From Table 13.2, we see that the United States had an export surplus in chemicals, agricultural food products, semiconductors, scientific equipment, and oil drilling and construction equipment. These are the products in which the United States has a (revealed) comparative advantage. The United States had an import surplus (and comparative disadvantage) in petroleum, automobiles, household appliances, apparel and household goods, computers, medical products, electrical generating machinery, telecommunications, and civilian aircraft.

TABLE 13.2. Major Goods Exports and Imports of the United States in 2011 (billions of dollars)

Exports	Value	Imports	Value
Automobiles	$133.1	Petroleum	$462.3
Petroleum products	131.4	Automobiles	255.2
Chemicals	123.1	Household appliances	136.4
Agricultural food products	117.4	Apparel and household goods	125.7
Computers	48.4	Computers	119.7
Electrical generating machinery	48.3	Medical products	91.8
Semiconductors	45.0	Agricultural food products	84.6
Medical products	44.9	Chemicals	75.4
Scientific equipment	42.7	Electrical generating machinery	59.5
Telecommunications	35.9	Telecommunications	48.5
Household appliances	34.0	Semiconductors	40.4
Civilian aircraft	33.4	Scientific equipment	35.9
Oil drilling and construction equipment	32.9	Civilian aircraft	35.5

Source: U.S. Department of Commerce, *Survey of Current Business* (Washington, D.C.: U.S. Government Printing Office, July 2012), pp. 70–71.

On the other hand, the United States imported goods and services (including income payments on foreign assets in the United States) for $3,181 billion in 2011. Goods imports included petroleum, automobiles, household appliances, apparel and household goods, computers, medical products, and many other products for a total of (−)$2,236 billion. The $427 billion imports of services included the travel and transportation services purchased by U.S. residents from other nations, fees and royalties paid to foreigners, as well as $518 billion in interest and dividends paid on foreign investments in the United States. Note that the inflow of foreign capital into the United States is recorded as a credit under financial transactions (an increase of foreign-owned assets in the United States), while the payments made to foreigners for the services of the foreign capital invested in the United States are recorded as a debit with other imported services in the U.S. balance of payments.

The United States made net unilateral transfers to foreigners of (−)$133 billion during 2011. These included net U.S. government economic and military grants to foreign nations (−$47 billion), net U.S. government pensions and other transfers to foreign nations (−$9 billion), and net private remittances and other transfers (−$77 billion). Private remittances and other transfers refer to the immigrant remittances to relatives "back home" and other private gifts. Since more of these private transfers were made to foreigners than were received by U.S. residents from abroad, the United States had a net debit entry of (−)$133 billion for private remittances and other transfers.

Next, Table 13.1 gives the small net debit capital account transactions (capital outflows) of (−)$1 billion for the United States in 2011. This includes, for the most part, debt forgiveness and goods and financial assets that migrants take with them as they enter or leave the country.

Following this, Table 13.1 shows that the stock of U.S.-owned assets abroad excluding financial derivatives increased (a capital outflow of the United States and a debit) by the net amount of (−)$484 billion during 2011. This resulted from an increase in the stock of U.S. official reserve assets of (−)$16 billion, a net increase in the stock of U.S. government assets other than official reserve assets of (−)$104 billion, and a net increase of (−)$364 billion in the stock of U.S. *private* assets abroad. The latter include a net increase in U.S. foreign direct investments abroad of (−)$419 billion, a net increase in U.S. holdings of foreign securities of (−)$147 billion, a net increase of (−)$12 billion in U.S. nonbank claims on foreigners, and a net *decrease* in U.S. bank claims on foreigners of (+)$214 billion.

The official reserve assets of the United States include the gold holdings of U.S. monetary authorities, Special Drawing Rights, the U.S. reserve position in the International Monetary Fund, and the official foreign currency holdings of U.S. monetary authorities. Special Drawing Rights (SDRs, or "paper gold") are international reserves created on the books of the International Monetary Fund (IMF) and distributed to member nations according to their importance in international trade. The reserve position in the IMF refers to the reserves paid in by the nation upon joining the IMF, which the nation can then borrow automatically and without questions asked in case of need. Membership in the IMF allows nations to borrow additional amounts subject to the conditions imposed by the IMF. (SDRs and the nation's reserve position in the IMF are discussed in detail in Chapter 21.)

Table 13.1 also shows that the stock of foreign-owned assets in the United States excluding financial derivatives increased (a capital inflow to the United States and a credit) by the net amount of (+)$1,001 billion in 2011. This included a net increase in the stock of foreign official assets in the United States of (+)$212 billion and a net increase in other (than official) foreign assets in the United States of (+)$789 billion. The latter included a net increase of (+)$234 billion in foreign direct investments in the United States, (+)$241 billion in foreign holdings of U.S. treasury securities, (+)$55 billion in U.S. currency, (+)$7 billion in U.S. nonbank liabilities to foreigners, (+)$309 billion in U.S. bank liabilities to foreigners, and a net *decrease* of (−)$56 billion in U.S. securities other than U.S. treasury securities.

Next, Table 13.1 shows a net decrease in foreign-owned financial derivatives in the United States (a U.S. capital inflow and credit) of $39 billion. Financial derivatives are complex assets or securities whose values often depend on the values of stocks and bonds. Financial derivatives were at the center of the global financial crisis that started in 2007 and will be discussed in Chapter 16.

When we sum the total credits of (+)$2,848 billion for U.S. exports of goods, services, and income, the (+)$1,001 billion net increase in foreign-owned assets in the United States, and the (+)$39 billion of net inflow of financial derivatives, we get the overall credit total of (+)$3,888 billion for the U.S. international transactions during 2011. On the other hand, adding up the debits of (−)$3,181 billion for the U.S. imports of goods, services, and income, the (−)$133 billion for the net unilateral transfers, the (−)$1 billion net capital account balance, and the(−)$484 billion net increase in U.S.-owned assets abroad, we get the overall debit total of (−)$3,798 billion. Since the overall credit total of (+)$3,888 billion exceeds the overall debit total of (−)$3,798 billion by (+)$90 billion, there is a *negative* entry called statistical discrepancy of (−)$89 billion (with a −$1 billion of rounding error) in Table 13.1 This entry is required to make the total credits (including the statistical discrepancy) equal to the total debits, as required by double-entry bookkeeping.

Note that a statistical discrepancy results from incorrectly recording or from not recording at all only one side of some transactions. (If both sides of a transaction are reported incorrectly or are not reported at all, no statistical discrepancy between total debits and total credits would arise because of double-entry bookkeeping.) Statistical discrepancies are particularly likely to arise in recording short-term international private capital flows. Thus, the (−)$89 billion statistical discrepancy is likely to reflect unrecorded net short-term private capital *outflows* from the United States during 2011. The memoranda items at the bottom of Table 13.1 are discussed next.

13.4 Accounting Balances and the Balance of Payments

The first accounting balance in the memoranda at the bottom of Table 13.1 is the balance on goods trade. In 2011, the United States exported $1,497 billion and imported $2,236 billion of goods, for a net debit balance on goods trade of (−)$738 (with a +$1 billion rounding error). On the other hand, the United States had a net credit balance on services of $179 billion (from the $606 billion export of services minus the $427 billion import of services). Thus, the United States had a net debit balance on goods and services of (−)$560 billion (with a −$1 billion rounding error). The United States also had a net surplus balance of (+)$227 billion on investment income (from the $745 billion interest and dividends earned on U.S. investment abroad minus the $518 billion income payments on foreign assets in the United States). The United States, therefore, had a net debit balance on goods, services, and income of (−)$333 billion.

Adding the net debit balance of (−)$133 billion of unilateral transfers to the net debit balance of (−)$333 billion on goods, services, and income, we get the current account net debit balance of (−)$466 billion. Thus, the current account lumps together all sales and purchases of currently produced goods and services, investment incomes, and unilateral transfers and provides the link between the nation's international transactions and its national income. Specifically, a current account surplus stimulates domestic production and income, while a current account deficit dampens domestic production and income. (This link between the nation's international trade and current account and its national income will be examined in detail in Chapter 17.)

Table 13.1 then shows the net debit balance of (−)$1 billion on capital account transactions (capital outflow) for the United States in 2011. As we have seen, the capital account includes, for the most part, debt forgiveness and goods and financial assets that migrants take with them as they leave or enter the country. As shown next, the U.S. deficit in the current and capital accounts in 2011 is financed or covered by an equal net inflow of capital from abroad.

Below the current and capital accounts there is the financial account. The financial account shows the change in U.S.-owned assets abroad and foreign-owned assets in the United States. From Table 13.1, we see that in 2011, U.S.-owned assets abroad excluding financial derivatives increased (a financial outflow from the United States and debit) by (−)$484 billion, while foreign-owned assets in the United States excluding financial derivatives increased (a financial inflow to the United States and a credit) by (+)$1,001 billion, giving a net credit balance of (+)$517 billion. Adding the net credit balance (+)$39 billion of financial derivatives and the net capital account debit balance of (−)$1 billion gives the net credit financial account balance of (+)$555 billion. Adding to this the statistical discrepancy of (−)$89 billion (net unrecorded capital outflows to the United States) gives the net credit balance of (+)$466 billion on financial account and statistical discrepancy for the United States in 2011. This exactly matches the sum of the net current account balance of (−)$466 billion of the United States in 2011. Thus, the United States covered its current account deficit with an equal net financial account (including the statistical discrepancy) surplus.

We have seen above that the financial account includes both private and official capital flows. If the net *private* capital inflows to the nation are not sufficient to cover the deficit in the nation's current and capital accounts, the nation is said to have a deficit in its balance of payments equal to the difference, which needs to be covered by a net credit balance on official (i.e., monetary authorities) reserve transactions.

The balance on official reserve transactions is called the official settlements balance or simply the *balance of payments*, and the account in which official reserve transactions are entered is called the official reserve account. The official settlements balance or balance of payments is given by the sum of the current account balance, the capital account balance, the balance in the financial account (excluding official or reserve transactions or flows but including the net balance of financial derivatives), and the statistical discrepancy. If the sum of these balances is negative, the nation has a deficit in the balance of payments, which must be covered by an equal amount of official reserve transactions (reduction in the international reserves of the nation or increase in foreign holdings of official assets of the nation). In the opposite situation the nation has a surplus in the balance of payments, which needs to be settled by an increase in the nation's international reserves and/or reduction in foreign official holdings of the nation's assets.

From Table 13.1, we get that the United States had a balance of payments deficit of (−)$196 billion in 2011. This is obtained by adding the current account deficit of (−)$466 billion, the net −$1 billion capital account balance, the increase in U.S.-owned assets abroad other than U.S. official reserve assets of (−)$468 billion (the $484 billion total *minus* (−)$16 billion of U.S. reserve assets), the increase in non-official foreign-owned assets in the United States of (+)$789 billion ($1,001 billion total minus the $212 billion increase in foreign official assets in the United States), the positive credit balance of (+)$39 billion on net financial derivatives, and the statistical discrepancy of (−)$89 billion. The U.S. balance of payments deficit of (−)$196 billion was covered by an equal credit balance of (+)$196 billion in official reserve transactions ($212 billion minus $16 billion) in 2011.

Thus, a balance of payments deficit is given (can be measured) either by the net *debit* balance on all non-official or autonomous transactions (the transactions undertaken for purely business purposes, except for unilateral transfers) or by the equal *credit* balance on official reserve or accommodating transactions (those transactions undertaken or needed to balance international transactions).

13.5 The Postwar Balance of Payments of the United States

In this section, we present a brief balance-of-payments history of the United States with the aid of Table 13.3. From Table 13.3, we see that the U.S. positive trade balance on goods (column 4) of the 1960s gave way to a negative trade balance on goods in the 1970s (for

TABLE 13.3. Summary of U.S. International Transactions: 1960–2011 (billions of dollars)

Year (1)	Exports of Goods, Services, and Income (2)	Imports of Goods, Services, and Income (3)	Balance on Goods Trade (4)	Balance on Goods, Services, and Income (5)	Balance on Current Account (6)	Increase (−) in U.S. Official Reserve Assets (7)	Increase (+) in Foreign Official Assets in the United States (8)
1960	31	−24	5	7	3	2	1
1965	43	−33	5	10	5	1	0
1966	46	−38	4	8	3	1	−1
1967	49	−41	4	8	3	0	3
1968	55	−49	1	6	1	−1	−1
1969	60	−54	1	6	0	−1	−1
1970	68	−60	2	8	2	3	7
1971	72	−66	−1	6	−1	3	27
1972	82	−79	−6	3	−6	1	10
1973	113	−99	1	14	7	0	6
1974	148	−137	−6	11	2	−1	11
1975	158	−133	9	25	18	−1	7
1976	172	−162	−9	10	4	−3	18
1977	185	−194	−31	−9	−14	0	37
1978	221	−230	−34	−9	−15	1	34
1979	288	−282	−28	6	0	0	−14

(continued)

■ TABLE 13.3. *(continued)*

Year (1)	Exports of Goods, Services, and Income (2)	Imports of Goods, Services, and Income (3)	Balance on Goods Trade (4)	Balance on Goods, Services, and Income (5)	Balance on Current Account (6)	Increase (−) in U.S. Official Reserve Assets (7)	Increase (+) in Foreign Official Assets in the United States (8)
1980	344	−334	−26	11	2	−7	15
1981	381	−364	−28	17	5	−4	5
1982	367	−356	−36	11	−6	−5	4
1983	356	−377	−67	−21	−39	−1	6
1984	400	−474	−112	−74	−94	−3	3
1985	388	−484	−122	−96	−118	−4	−1
1986	407	−530	−145	−123	−147	0	36
1987	457	−594	−160	−137	−161	9	45
1988	568	−664	−127	−96	−121	−4	40
1989	648	−722	−118	−73	−99	−25	9
1990	707	−759	−111	−52	−79	−2	34
1991	728	−735	−77	−7	3	6	17
1992	751	−766	−97	−15	−50	4	40
1993	779	−824	−132	−47	−85	−1	72
1994	870	−951	−166	−81	−122	5	40
1995	1,005	−1,080	−174	−75	−114	−10	110
1996	1,078	−1,159	−191	−82	−125	7	127
1997	1,191	−1,287	−198	−96	−141	−1	19
1998	1,195	−1,357	−248	−162	−215	−7	−20
1999	1,262	−1,514	−336	−251	−302	9	44
2000	1,425	−1,783	−446	−358	−416	0	43
2001	1,300	−1,632	−421	−332	−397	−5	28
2002	1,264	−1,656	−474	−392	−457	−4	116
2003	1,346	−1,793	−540	−447	−519	2	278
2004	1,579	−2,119	−664	−540	−629	3	398
2005	1,825	−2,465	−781	−640	−746	14	259
2006	2,144	−2,854	−836	−709	−801	2	488
2007	2,488	−3,084	−819	−595	−710	0	481
2008	2,657	−3,208	−830	−551	−677	−5	555
2009	2,181	−2,440	−506	−259	−382	−52	480
2010	2,519	−2,830	−645	−311	−442	−2	398
2011	2,848	−3,181	−738	−333	−466	−16	212

Source: U.S. Department of Commerce, *Survey of Current Business* (Washington, D.C.: U.S. Government Printing Office, July 2012), pp. 58–59 and various previous issues.

the first time in over 50 years), which became very large after 1982. To a large extent, this reflected the sharp rise in the price of imported petroleum products during the 1970s, the high international value of the dollar in the 1980s, and the more rapid growth of the United States than Europe and Japan during the 1990s and 2000s. Case Study 13-2 gives the major trade partners of the United States and the trade balance with each of them in 2011, while Case Studies 13-3 and 13-4 examine, respectively, the U.S.–Japan and the U.S.–China trade deficits and trade during the past two-and-a-half or three decades.

CASE STUDY 13-2 The Major Trade Partners of the United States

Table 13.4 shows the value of U.S. exports and imports of goods and services, and the net balance with its 14 major trade partners in 2011 arranged by the total amount of trade with the United States. The table shows that the largest trade partners of the States in 2011 were Canada, China, Mexico, Japan, Germany, the United Kingdom, and Korea. The table also shows that the United States had a huge trade deficit with China and this is the source of sharp trade disagreements (see Case Study 13-3). The United States also had large trade deficits with Mexico, Japan, Germany, and Canada in 2011, but clearly the U.S. trade deficit with China dominated.

TABLE 13.4. U.S. Trade in Goods and Services and Net Balance with Its Major Trade Partners in 2011 (billions of dollars)

Country	Exports	Imports	Total	Net Balance
Canada	$282.3	$320.5	$602.8	$−38.2
China	105.3	400.6	505.9	−295.3
Mexico	198.7	267.3	466.0	−68.6
Japan	67.2	131.8	199.0	−64.6
Germany	49.6	99.4	149.0	−49.8
United Kingdom	57.0	51.9	108.9	+5.1
Korea, Rep. of	45.2	57.5	102.7	−12.3
Brazil	42.8	31.5	74.3	+11.3
France	28.5	40.7	69.2	−12.2
Taiwan (China)	27.1	41.5	68.6	−14.4
Netherlands	42.6	24.0	66.6	+18.6
India	21.6	36.3	58.0	−14.7
Singapore	31.4	20.1	51.5	+11.3
Italy	16.2	34.3	50.5	−18.1

Source: U.S. Department of Commerce, *Survey of Current Business* (Washington, D.C.: U.S. Government Printing Office, July 2012), pp. 64–69.

Adding together columns 7 and 8 gives the official settlements balance. Keeping in mind that a positive official settlements balance represents a deficit in U.S. international transactions, while a negative balance represents a surplus, we see that the United States had its first large balance-of-payments deficit (of $10 billion) in 1970. The deficit rose sharply in 1971, when it reached $30 billion. Since 1973 the United States has had a deficit in its international transactions in every year except 1979, 1982, 1984–1985, 1989, and 1998. The yearly U.S. balance-of-payments deficit exceeded $30 billion in 1977–1978, 1986–1988, 1990, and 1992–1994; it exceeded $40 billion in 1992–1994, and $100 billion in 1995–1996. Since 2003 it exceeded $200 billion. In 2008, the United States had the largest balance-of-payments deficit on record ($550 billion). In 2011, the U.S. balance-of-payments deficit was $196 billion.

CASE STUDY 13-3 The U.S. Trade Deficit with Japan

Figure 13.1 shows the U.S. trade deficit with Japan in goods and in goods and services, from 1980 to 2011. The U.S. trade deficit on goods and services is smaller than the U.S. trade deficit on goods alone because of the trade surplus in services that the United States has with Japan. Both deficits increased sharply from 1980 to 1987, decreased until 1990, increased up to 1994, decreased in 1995 and 1996, increased until 2000, and were $65 billion and $44 billion, respectively in 2011. The U.S. trade deficit with Japan is of particular interest because of its size and persistence, which gave rise to major trade frictions between the two countries.

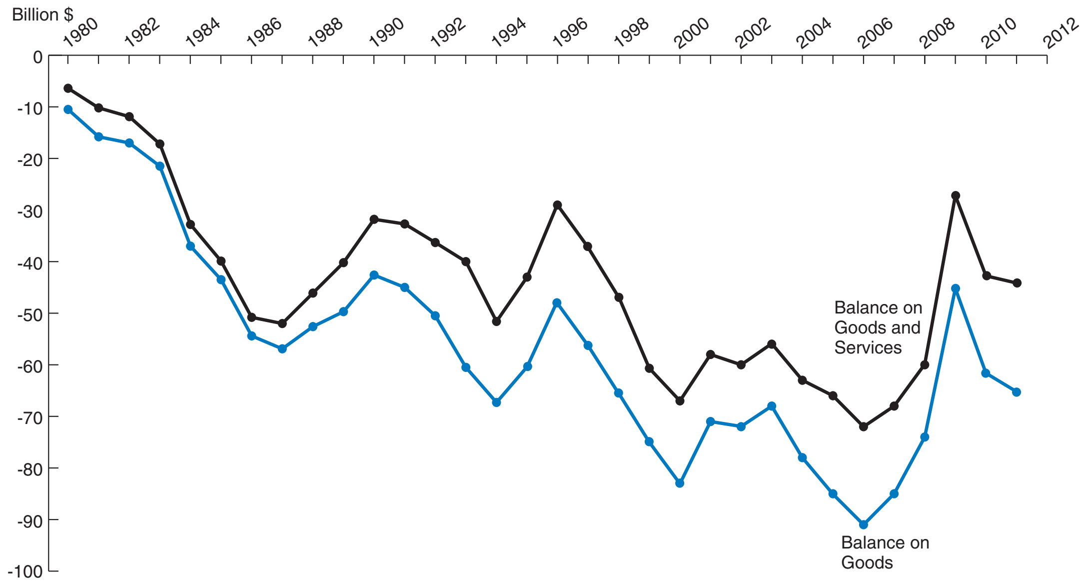

FIGURE 13.1. The U.S. Trade Balance with Japan in Goods and in Goods and Services, 1980–2011. The U.S. Trade Deficit with Japan in goods and in goods and services fluctuated around a declining trend and were $65 billion and $44 billion, respectively, in 2011.
Source: U.S. Department of Commerce, *Survey of Current Business* (Washington, D.C.: U.S. Government Printing Office, various issues).

Several important points must be kept in mind in examining a nation's balance of payments. First, too much attention is generally placed on the balance on goods and on short-term data. The reason may be that data on the quarterly trade balance on goods are the first to become available. It is also dangerous to extrapolate for the year based on quarterly data. Even the notion of a positive trade balance on goods being favorable is somewhat misleading because a positive trade balance means that the nation has fewer goods to consume domestically. On the other hand, a large and persistent trade deficit (say, in excess of 2 or 3 percent of GDP) may not be sustainable in the long run for an individual country. This problem will be examined in Chapter 17.

CASE STUDY 13-4 The Exploding U.S. Trade Deficit with China

Figure 13.2 shows the value of U.S. goods exports and imports from China from 1985 to 2011. U.S. imports from China grew much faster than U.S. exports and resulted in a very large and fast-rising U.S. trade deficit with China ($295.3 billion in 2011). In fact, in 2000 China replaced Japan as the nation with which the United States has the largest trade deficit; in 2011, the U.S. trade deficit with China was 4.6 times the U.S. trade deficit with Japan. Although it is normal for a large and rapidly growing developing country such as China to have a trade surplus, its huge size and extremely rapid growth are creating major difficulties in U.S.–China trade relations.

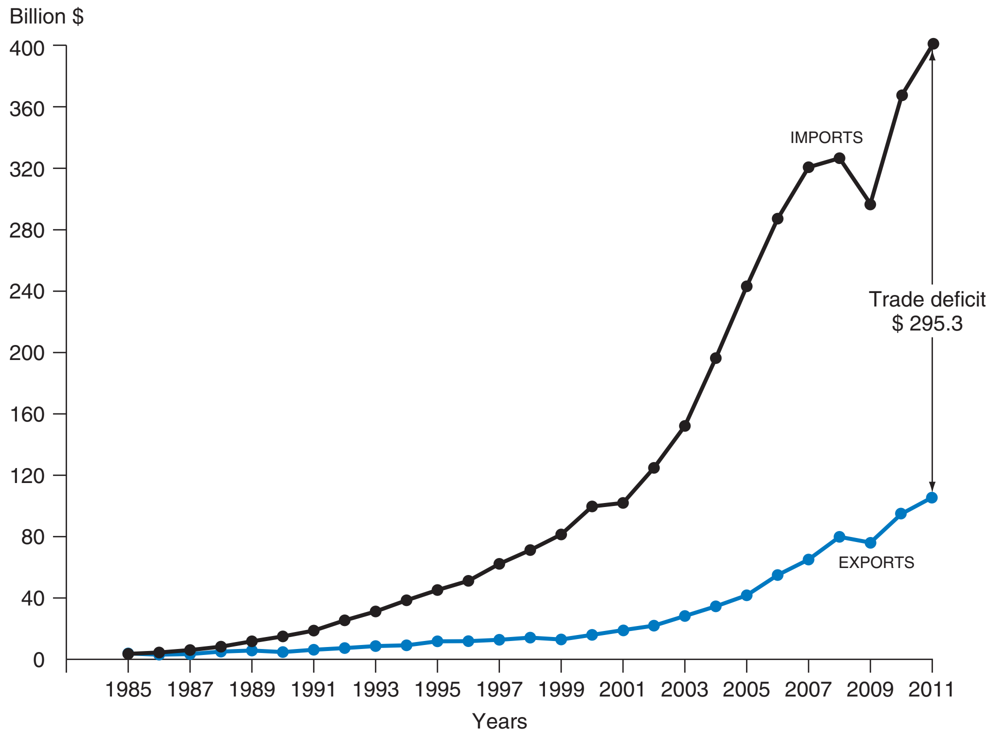

FIGURE 13.2. U.S. Exports, Imports, and Net Trade Balance in Goods with China, 1985–2011 (billions of dollars). U.S. imports from China grew much faster than its exports. This resulted in a huge trade deficit.
Source: U.S. Department of Commerce, *Survey of Current Business* (Washington, D.C.: U.S. Government Printing Office, various issues).

Second, it is also important to keep in mind that international transactions are closely interrelated rather than independent. For example, cutting U.S. foreign aid programs also reduces the ability of recipient nations to import from the United States. Therefore, the possible improvement in the U.S. balance of payments is likely to be much less than the reduction in the amount of foreign aid given, particularly if the aid is tied to (must be spent in) the United States. Third, an attempt to reduce the U.S. trade deficit with respect to a nation such as China is likely to reduce the U.S. surplus with respect to Brazil because Brazil pays for U.S. goods partly through natural resource exports to China. In a world of multilateral trade and highly interdependent transactions, the interpretation of a nation's statement of international transactions must be approached very cautiously, especially when trying to establish causality.

13.6 The International Investment Position of the United States

While a nation's balance of payments measures the international *flow* of goods, services, and capital *during a one-year period*, the international investment position measures the total amount and the distribution of a nation's assets abroad and foreign assets in the nation

TABLE 13.5. The U.S. International Investment Position, Selected Years: 1980–2011 (at current cost, billions of dollars at year end)

	1980	1990	2000	2005	2010	2011*
Net international investment position of the United States	$360	$ – 230	$ – 1, 337	$ – 1, 932	$ – 2, 474	$ – 4, 030
Net international investment position, excluding financial derivatives	360	–230	–1, 337	–1, 990	–2, 584	–4, 157
U.S.-owned assets abroad	930	2, 179	6, 239	11, 962	20, 298	21, 132
U.S.-owned assets abroad, excluding financial derivatives	930	2, 179	6, 239	10, 772	16, 646	16, 428
U.S. official reserve assets	171	175	128	188	489	536
Gold	156	102	72	134	368	400
SDRs	3	11	11	8	57	55
Reserve position in IMF	3	9	15	8	12	30
Foreign currencies	10	52	31	38	52	51
Other U.S. government assets	66	84	85	78	75	179
U.S. private assets	693	1, 920	6, 025	10, 506	16, 082	15, 713
Direct investments	388	617	1, 532	2, 652	4, 307	4, 682
Foreign securities	62	342	2, 426	4, 329	6, 336	5, 922
Other	243	961	2, 067	3, 525	5, 439	5, 109
Foreign-owned assets in the U.S.	569	2, 409	7, 576	13, 894	22, 772	25, 163
Foreign-owned assets in the U.S., excluding financial derivatives	569	2, 409	7, 576	12, 762	19, 230	20, 584
Foreign official assets in the U.S.	181	380	1, 037	2, 313	4, 913	5, 251
Other foreign assets	388	2, 029	6, 539	10, 448	14, 317	15, 333
Direct investments	127	505	1, 421	1, 906	2, 598	2, 909
Other	261	1, 524	5, 118	8, 542	11, 719	12, 424

*Data for 2011 are preliminary; final (revised) data are in July 2013 *Survey of Current Business*.
Source: U.S. Department of Commerce, *Survey of Current Business* (Washington, D.C.: U.S. Government Printing Office), July 2011, pp. 122–123 and July 2012, p. 17.

at the end of the year. Thus, the balance of payments represents a flow concept, and the international investment position (often called the *balance of international indebtedness*) represents a stock concept.

The statement of a nation's international investment position can be used to project the future flow of income or earnings from the nation's foreign investments and the flow of payments on foreign investments in the nation. Furthermore, adding the nation's capital flows during a particular year to its international investment position at the end of the *previous* year should give the international investment position of the nation at the end of the particular year, in the absence of a statistical discrepancy and if the stock of U. S. direct investments abroad and foreign direct investments in the United States were revalued to reflect price and exchange rate changes during the year.

Table 13.5 gives the international investment position of the United States at the end of 1980, 1990, 2000, 2005, 2010, and 2011, with foreign direct investment valued at current (i.e., replacement) cost. From the table, we see that the U.S. international investment position deteriorated sharply from +\$360 billion at the end of 1980 to (−)\$4,030 billion at the end of

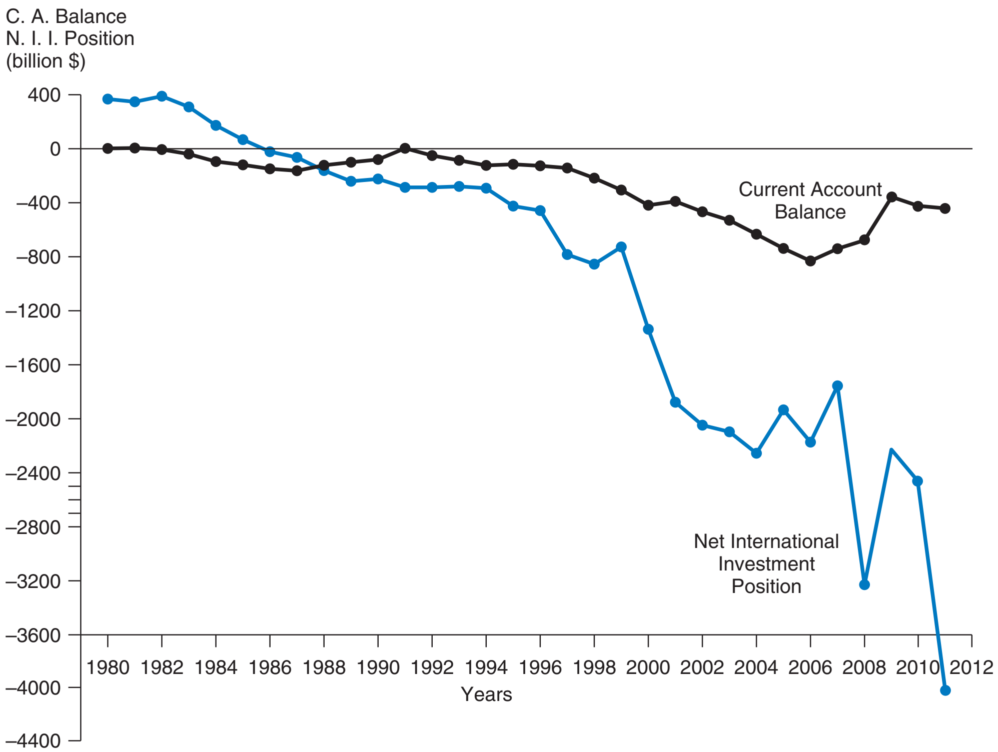

FIGURE 13.3. The U.S. Current Account Balance and the Net International Investment Position, 1980–2011.

The United States had current account deficits in every year except 1980, 1981, and 1991. U.S. current account deficits became very large and increased rapidly after 1997. The U.S. net international investment position was positive from 1980 to 1985 and negative thereafter, and it increased sharply after 1999.

Source: U.S. Department of Commerce, *Survey of Current Business* (Washington, D.C.: U.S. Government Printing Office, July 2011), pp. 70–71 and 122–123.

2011. Table 13.5 also shows that the amount of U.S.-owned assets abroad increased 23 times from $930 billion in 1980 to $21,132 billion in 2011. Foreign-owned assets in the United States increased even faster (44 times), from $569 billion in 1980 to $25,163 billion in 2011. Figure 13.3 shows the sharp increase in the U.S. current account deficit after 1997 and the deterioration in its net international investment position after 1999. As a result, the United States became a large (in fact the largest) debtor nation in the 1990s (see Case Study 13-5).

CASE STUDY 13-5 The United States as a Debtor Nation

The shift of the United States from net creditor to debtor nation in 1985 gave rise to a lively debate among economists, politicians, and government officials on the benefits and risks of this development. On the benefit side, large foreign investments allowed the United States to finance about half of its budget deficit during the mid-1980s without the need for higher interest rates and more "crowding out" of private investments. A portion of foreign investments also went into businesses, farms, real estate, and other property, which made more rapid growth possible in the United States. It has been estimated that foreign investments created about 2.5 million additional jobs in the United States during the 1980s and also helped spread some new and more efficient managerial techniques from abroad.

To the extent that foreign investments went into directly productive activities with returns greater than the interest and dividend payments flowing to foreign investors, this investment was beneficial to the United States. On the other hand, the portion of foreign investments that simply went to finance larger U.S. consumption expenditures led to interest and dividend payments to foreign investors and represents a real burden or drain on future consumption and growth in the United States. As the largest and richest nation in the world, there is no question that the United States could repay its foreign debt if called upon to do so. At about 18 percent of its gross national income (GNI), the U.S. foreign debt is relatively smaller than that of much poorer developing nations. It is the burden that the foreign debt imposes on future generations as well as the siphoning off of capital from poorer nations that are more troublesome.

There is also the danger that foreigners, for whatever reason, may suddenly withdraw their funds. This would lead to a financial crisis and much higher interest rates in the United States. Rising income payments to foreigners on their investments also means a worsening of the U.S. current account balance in the future. They also drain resources and reduce growth in the rest of the world. On a more general level, some people fear that foreign companies operating in the United States can transfer advanced American technology abroad. This could also lead to some loss of domestic control over political and economic matters in the United States as foreign executives and their lobbyists become ever more familiar figures in the corridors of Congress, state houses, and city halls. There is a bit of irony in all of this—these were the very complaints usually heard from Canada, European nations, and developing countries with regard to the large U.S. investments in their countries during the 1950s, 1960s, and 1970s. With the great concern often voiced during the second half of the 1980s about the dangers of foreign investments to the United States, the tables seemed to have turned. Such fears all but disappeared during the 1990s (when most nations eagerly sought to attract foreign direct investments) only to resurface in the last decade.

Sources: "A Note on the United States as a Debtor Nation," *Survey of Current Business* (Washington, D.C.: U.S. Government Printing Office, June 1985), p. 28; and "The International Investment Position of the United States," *Survey of Current Business* (July 2008–2012).

SUMMARY

1. The balance of payments is a summary statement of all the transactions of the residents of a nation with the rest of the world during a particular period of time, usually a year. Its main purpose is to inform monetary authorities of the international position of the nation and to aid banks, firms, and individuals engaged in international trade and finance in their business decisions.

2. International transactions are classified as credits or debits. Credit transactions are those that involve the receipt of payments from foreigners. Debit transactions are those that involve payments to foreigners. The export of goods and services, unilateral transfers from foreigners, and capital and financial inflows are credits and are entered with a positive sign. The import of goods and services, unilateral transfers to foreigners, and capital and financial outflows are debits and are entered with a negative sign. In a nation's balance of payments, each transaction is recorded twice, once as a credit and once as a debit of an equal amount. This is known as double-entry bookkeeping. This ensures that total credits equal the total debits (including the statistical discrepancy) for the balance of payments statement as a whole.

3. In 2011, U.S. exports of goods and services as well as income receipts on U.S. assets abroad amounted to $2,848 billion, while U.S. imports of goods and services and income payments on foreign assets were (−)$3,181. The United States also made net unilateral transfers to foreigners equal to (−)$133 billion. This gave a net current account deficit of (−)$466 billion. The United States had a net capital inflow of (−)$1 billion. It had a net financial outflow (including official reserve assets) of (−)$484 billion and a net financial inflow (including foreign official reserve assets) of (+)$1,001 billion. It also had a net inflow of financial derivatives of (+)$39 billion. A statistical discrepancy debit entry of (−)$89 billion was necessary to make total credits equal to total debits, as required by double-entry bookkeeping.

4. All transactions in the current, capital, and financial accounts other than official reserve assets (but including financial derivatives) are called autonomous transactions. If total debits on these autonomous items exceed total credits, the nation has a deficit in its balance of payments equal to the net debit balance. The deficit is then settled by an equal net credit balance on the accommodating, official asset, or reserve transactions. The opposite is the case for a balance of payments surplus. This measure of the balance of payments is called the official settlements balance.

5. The United States had its first large balance of payments deficit in 1970, and this was followed by a much larger deficit in 1971. Since then the United States has had a deficit in its international transactions in every year, except 1979, 1982, 1984–1985, 1989, and 1998. The U.S. balance-of-payments deficit exceeded $30 billion in each year in 1977–1978, 1986–1988, 1990, and 1992–1994. It reached $100 billion in 1995, the maximum of $550 billion in 2008, and it was $196 billion in 2011.

6. The international investment position, or balance of indebtedness, measures the total amount and distribution of a nation's assets abroad and foreign assets in the nation at year's end. Its usefulness is in projecting the future flow of income from U.S. foreign investments and payments on foreign investments in the United States. In 1985, the United States became a net debtor nation for the first time since 1914 and is now the largest debtor nation in the world.

A LOOK AHEAD

In the next chapter we examine the operation of the foreign exchange markets, and in Chapter 15 we present monetary theories of exchange rate determination. Part Four (Chapters 16 to 21) will then be concerned with the various mechanisms for adjusting balance-of-payments disequilibria, or open-economy macroeconomics, and the operation of the present international monetary system.

KEY TERMS

Accommodating transactions, p. 407
Autonomous transactions, p. 407
Balance of payments, p. 397
Capital account, p. 404
Credit transactions, p. 398
Current account, p. 406
Debit transactions, p. 398
Deficit in the balance of payments, p. 406
Double-entry bookkeeping, p. 399
Financial account, p. 406
Financial inflow, p. 399
Financial outflow, p. 399
International investment position, p. 412
Official reserve account, p. 406
Official settlements balance, p. 406
Statistical discrepancy, p. 405
Surplus in the balance of payments, p. 406
Unilateral transfers, p. 400

QUESTIONS FOR REVIEW

1. What is meant by the balance of payments? In what way is the balance of payments a summary statement? What is meant by an international transaction? How is a resident of a nation defined? In what way is the time element involved in measuring a nation's balance of payments?

2. What is a credit transaction? a debit transaction? Which are the broad categories of international transactions classified as credits? as debits?

3. What is double-entry bookkeeping? Why does double-entry bookkeeping usually involve an entry called statistical discrepancy? How does such a statistical discrepancy arise?

4. What is meant by the current account? Did the United States have a deficit or a surplus in the current account in 2011? What was its size?

5. What was the size of the net financial outflows (including U.S. official reserve assets) in 2011? What was the size of the net financial inflows to the United States in 2011?

6. Why is the classification of international financial flows into short term and long term not stressed anymore today as it was in the past?

7. How was the statistical discrepancy of (−) \$89 billion for 2011 arrived at? By how much did U.S. official reserve assets change in 2011? By how much did foreign official reserve assets change in 2011?

8. Which items does the financial account include? What is meant by the autonomous transactions? accommodating transactions? Which items does the official reserve account include?

9. How is an official settlements deficit or surplus measured? What was the size of the U.S. balance of payments in 2011?

10. What are the most serious pitfalls to avoid in analyzing a nation's balance of payments or statements of international transactions?

11. What were the cause and effect of the large U.S. trade imbalance during the postwar period?

12. What is meant by the international investment position of a nation, or its balance of international indebtedness? What is its relationship to the nation's balance of payments?

13. What is the most important use of the statement of the international investment position of a nation?

14. What are the benefits and risks of the United States becoming a net debtor nation?

PROBLEMS

***1.** Indicate how each of the following international transactions is entered into the U.S. balance of payments with double-entry bookkeeping:

(a) A U.S. resident imports $500 worth of merchandise from a U.K. resident and agrees to pay in three months.

(b) After the three months, the U.S. resident pays for his imports by drawing down his bank balances in London.

(c) What is the net effect of transactions (a) and (b) on the U.S. balance of payments if they occur during the same year?

2. Indicate how each of the following international transactions is entered into the U.S. balance of payments with double-entry bookkeeping:

(a) The U.S. government gives a $100 cash balance in a U.S. bank to a developing nation as part of the U.S. foreign aid program.

(b) The developing nation uses the $100 bank balance to import $100 worth of food from the United States.

(c) What is the net effect of transactions (a) and (b) on the U.S. balance of payments if they occur during the same year?

3. Indicate how the following transactionis entered into the U.S. balance of payments with double-entry bookkeeping:

(a) The U.S. government gives $100 worth of food aid to a developing nation.

(b) What is the difference in their effect on the balance of payments between transaction (a) in this problem, on the one hand, and the net result of transactions (a) and (b) in Problem 2, on the other?

4. Indicate how the following transaction is entered into the U.S. balance of payments with double-entry bookkeeping: A U.S. resident purchases a $1,000 foreign stock and pays for it by drawing down her bank balances abroad.

5. Indicate how the following transaction is entered into the U.S. balance of payments with double-entry bookkeeping: A U.S. resident receives a dividend of $100 on her foreign stock and deposits it into her bank account abroad.

***6.** Indicate how the following transaction is entered into the U.S. balance of payments with double-entry bookkeeping: A foreign investor purchases $400 of U.S. treasury bills and pays by drawing down his bank balances in the United States.

***7.** Indicate how the following transaction is entered into the U.S. balance of payments with double-entry bookkeeping: At maturity (during the same year), the foreign investor of Problem 6 receives $440 for the principal and interest earned and deposits these *dollars* in his bank account in his own nation.

8. Indicate how the following transaction is entered into the U.S. balance of payments with double-entry bookkeeping:

(a) A U.S. commercial bank exchanges $800 worth of pounds sterling for dollars at the Federal Reserve Bank of New York.

(b) What effect does this transaction have on the official settlements balance of the United States?

9. **(a)** From Table 13.3, calculate the official settlements balance of the United States for each year from 1965 to 2011.

(b) Why is this an appropriate measure for the U.S. balance-of-payments position until 1972, but not as appropriate since 1973?

10. Update Table 13.1 for the most recent year.

11. Update Table 13.2 for the most recent year.

12. Update Table 13.3 for the most recent year.

13. Update Table 13.4 for the most recent year.

14. Update Table 13.5 for the most recent year.

*= Answer provided at www.wiley.com/college/salvatore.

APPENDIX

A13.1 The IMF Method of Reporting International Transactions

This appendix presents the method of measuring the balance of payments that all nations must use in reporting to the International Monetary Fund. This standardized reporting method is useful because it ensures consistency and permits international comparisons of the balance of payments of different nations.

Table 13.6 summarizes the balance of payments of the United States, Japan, Germany, the United Kingdom, France, Italy, and Canada for the year 2010 in the standard form required by the International Monetary Fund. Table 13.7 summarizes the balance of payments of Spain, Korea, China, India, Brazil, Russia, and Mexico.

From Section A in Table 13.6, we see that in 2010 the United States had a net debit balance in the current account equal to (−)\$470.9 billion, while Japan had a net current account *credit* balance of (+)\$195.8 billion. The current account balance was (+)\$187.9 billion for Germany, (−)\$71.6 billion for the United Kingdom, (−)\$44.5 billion for France, (−)\$71.2 billion for Italy, and (−)\$49.3 billion for Canada.

Section B in Table 13.6 gives the capital account. This measures capital transfers and acquisition/disposal of nonproduced, nonfinancial assets. *Capital transfers* consists of those involving transfer of ownership of fixed assets and transfers of funds linked to the acquisition and disposal of fixed assets. *Acquisition/disposal of nonproduced, nonfinancial assets* covers intangibles such as patents, leases, and other transferable contracts. From Table 13.6, we see that the balances of capital accounts for all seven countries were very small in 2010.

Section C of Table 13.6 gives the financial account. It measures direct investments (from and to the nation), portfolio investment assets and liabilities (equity securities and debt), and other investment assets and liabilities of monetary authorities, general government, banks, and other sectors. The traditional distinction between short-term and long-term capital is no longer made, except for other investments (where maturity, as in the case of foreign debt, is important). New money market and other financial instruments and derivatives are recorded in the portfolio component of this account. In 2010, the financial account had a balance of \$256.1 billion for the United States, −\$130.5 billion for Japan, −\$184.8 billion for Germany, \$63.6 billion for United Kingdom, \$31.8 billion France, \$117.7 billion for Italy, and \$47.4 billion for Canada.

Summing up the balance in current account (Section A), capital account (Section B), financial account (Section C), and net errors and omissions (Section D) gives the nation's balance of payments. From Table 13.6, we see that all nations were practically in equilibrium, except Japan, which had a small balance of payments surplus, covered by an equal balance with an opposite sign in Section E (reserves and related items) of the table.

Problem Indicate the major difference between the way the United States keeps its balance of payments (Table 13.1) and the International Monetary Fund method (Table 13.6).

TABLE 13.6. IMF Balance-of-Payments Summary Presentation: United States, Japan, Germany, United Kingdom, France, Italy, and Canada in 2010 (billions of U.S. dollars)*

	United States	Japan	Germany	United Kingdom	France	Italy	Canada
A. Current Account	**−470.9**	**195.8**	**187.9**	**−71.6**	**−44.5**	**−71.2**	**−49.3**
Goods: exports f.o.b.	1,293.2	730.1	1,303.3	410.2	517.2	448.4	393.2
Goods: imports f.o.b.	−1,935.6	−639.1	−1,098.6	−563.2	−588.4	−475.7	−401.9
Balance of Goods	*−642.4*	*91.0*	*204.7*	*−152.9*	*−71.2*	*−27.3*	*−8.7*
Services: credit	544.4	141.5	237.8	238.8	145.0	98.7	69.2
Services: debit	−402.0	−157.6	−263.4	−169.1	−132.2	−110.7	−91.3
Balance on Goods and Services	*−500.0*	*74.9*	*179.1*	*−83.3*	*−58.5*	*−39.2*	*−30.8*
Income: credit	663.2	173.7	230.5	255.4	208.5	73.6	60.0
Income: debit	−498.0	−40.4	−170.9	−212.9	−159.6	−84.3	−76.0
Balance on Goods, Services, and Income	*−334.8*	*208.2*	*238.7*	*−40.8*	*−9.6*	*−49.8*	*−46.7*
Current transfers: credit	16.1	10.1	22.7	22.0	24.1	23.2	9.0
Current transfers: debit	−152.2	−22.5	−73.5	−52.7	−59.0	−44.5	−11.6
B. Capital Account	−0.2	−5.0	−0.8	5.0	0.1	−0.7	4.6
Capital account: credit	—	0.9	4.2	9.4	1.3	2.3	5.3
Capital account: debit	−0.2	−5.9	−5.1	−4.4	−1.2	−3.0	−0.7
Total Groups A plus B	*−471.1*	*190.8*	*187.1*	*−66.6*	*−44.4*	*−72.0*	*−44.7*
C. Financial Account	256.1	−130.5	−184.8	63.6	31.8	117.7	47.4
Direct investment abroad	−351.4	−57.2	−108.4	−10.7	−84.4	−20.4	−39.1
Direct investment in the nation	236.2	1.4	46.1	47.0	33.7	9.6	23.6
Portfolio investment assets	−165.6	−262.5	−231.1	−130.9	28.6	−43.2	−14.0
Equity securities	−79.1	−21.5	−28.5	−12.6	−23.5	−54.5	−12.9
Debt securities	−86.5	−241.2	−202.6	−118.3	52.1	11.4	−1.1
Portfolio investment liabilities	706.9	111.6	61.4	143.9	128.9	94.0	114.1
Equity securities	172.4	40.3	−2.0	3.6	−8.4	3.8	17.8
Debt securities	534.5	71.3	63.4	140.4	137.4	90.2	96.3
Financial derivatives	13.7	11.9	−22.9	44.9	45.2	3.0	—
Financial derivatives assets	—	403.5	—	—	—	9.6	—
Financial derivatives liabilities	—	−391.5	−22.9	44.9	45.2	−6.5	—
Other investment assets	−486.4	−130.1	−163.6	−359.9	−159.7	57.7	−46.8
Monetary authorities	10.2	—	−193.5	—	−14.4	66.8	—
General government	−2.7	−13.0	−82.5	−1.6	−4.4	—	−0.7
Banks	−427.0	−116.7	188.0	−212.2	−140.2	−4.5	−25.7
Other sectors	−66.9	−0.5	−75.6	−146.2	−0.8	−4.6	−20.5
Other investment liabilities	302.6	197.3	233.8	329.2	39.5	16.9	9.7
Monetary authorities	28.3	—	7.4	—	−39.7	3.5	—
General government	12.1	−10.7	126.2	1.2	0.3	−0.1	−0.2
Banks	207.3	93.2	98.4	96.7	78.5	15.5	10.8
Other sectors	54.8	114.8	1.8	231.4	0.4	−2.0	−0.9
Total, Groups A Through C	*−214.9*	*60.3*	*2.4*	*−3.0*	*−12.7*	*45.8*	*2.7*
D. Net Errors and Omissions	216.8	−16.5	−0.2	13.0	20.5	−44.4	1.1
Total, Groups A Through D	*1.8*	*43.9*	*2.1*	*10.0*	*7.8*	*1.3*	*3.8*
E. Reserves and Related Items	−1.8	−43.9	−2.1	−10.0	−7.8	−1.3	−3.8
Reserve assets	−1.8	−43.9	−2.1	−10.0	−7.8	−1.3	−3.8
Use of fund credit and loans	—	—	—	—	—	—	—
Exceptional financing	—	—	—	—	—	—	—
Conversion rate per U.S. dollar	—	87.78	.7550	.64718	.7550	.7550	1.0302

*Some totals do not add up because of rounding; values for the United States differ slightly from those in Table 13.1 because of slightly different definitions and data revisions.

Source: International Monetary Fund, *Balance of Payments Statistics Yearbook* (Washington, D.C.: IMF, 2011).

TABLE 13.7. IMF Balance-of-Payments Summary Presentation: Spain, Korea, China, India, Brazil, Russia, and Mexico in 2010 (billions of U.S. dollars)*

	Spain	Rep. of Korea	China	India	Brazil	Russia	Mexico
A. Current Account	**−64.3**	**28.2**	**305.4**	**−51.8**	**−47.4**	**70.3**	**−5.7**
Goods: exports f.o.b.	253.0	464.3	1,581.4	225.5	201.9	400.4	298.9
Goods: imports f.o.b.	−315.3	−422.4	−1,327.2	−323.4	−181.7	−248.7	−301.9
Balance of Goods	*−62.4*	*41.9*	*254.2*	*−97.9*	*20.2*	*151.7*	*−3.1*
Services: credit	123.6	82.7	171.2	123.8	31.8	45.1	14.9
Services: debit	−87.1	−93.9	−193.3	−116.8	−62.6	−74.3	−25.1
Balance on Goods and Services	*−25.8*	*30.7*	*232.1*	*−91.0*	*−10.6*	*122.5*	*−13.3*
Income: credit	54.8	15.9	144.6	9.6	7.4	37.4	5.3
Income: debit	−83.8	−15.1	−114.2	−22.5	−46.9	−86.0	−19.2
Balance on Goods, Services, and Income	*−54.8*	*31.4*	*262.4*	*−103.9*	*−50.2*	*73.9*	*−27.2*
Current transfers: credit	24.5	13.4	49.5	55.0	4.7	10.0	21.6
Current transfers: debit	−34.0	−16.6	−6.6	−2.9	−1.9	−13.6	−0.1
B. Capital Account	**8.4**	**−0.2**	**4.6**	**—**	**1.1**	**0.1**	**—**
Capital account: credit	10.5	1.9	4.8	—	1.5	1.0	—
Capital account: debit	−2.2	−2.1	−0.2	—	−0.3	−1.0	—
Total Groups A plus B	*−56.0*	*28.0*	*310.0*	*−51.8*	*−46.2*	*70.3*	*−5.7*
C. Financial Account	**60.3**	**1.9**	**221.4**	**68.5**	**98.5**	**−26.0**	**36.7**
Direct investment abroad	−20.6	−19.2	−60.2	−13.2	−11.5	−52.5	−13.6
Direct investment in the nation	24.7	−0.2	185.1	24.2	48.4	42.8	19.6
Portfolio investment assets	91.2	−3.5	−7.6	−1.1	−4.8	−3.5	2.3
Equity securities	−11.9	−4.9	−8.4	−1.1	6.2	−1.4	—
Debt securities	103.1	1.4	0.8	—	−11.0	−2.0	2.3
Portfolio investment liabilities	−43.5	42.1	31.7	40.0	67.8	1.8	37.1
Equity securities	−4.8	23.0	31.4	40.0	37.7	−4.8	0.6
Debt securities	−38.7	19.1	0.3	—	30.1	6.6	36.5
Financial derivatives	9.8	—	—	—	−0.1	−1.8	—
Financial derivatives assets	—	49.6	—	—	0.1	8.8	—
Financial derivatives liabilities	9.8	−49.6	—	—	−0.2	−10.7	—
Other investment assets	−20.6	−12.3	−116.3	−13.7	−42.6	−22.8	−20.8
Monetary authorities	—	−0.2	−24.5	—	0.5	—	—
General government	−4.3	−0.7	—	−0.1	—	−0.3	—
Banks	−9.4	−5.5	−24.0	0.4	1.8	−4.7	−3.4
Other sectors	−7.0	−6.0	−116.7	−14.0	−44.9	−17.8	−17.4
Other investment liabilities	19.4	−5.0	188.7	32.3	41.3	10.0	11.9
Monetary authorities	11.0	−0.1	34.1	−0.5	−0.1	−2.4	−3.2
General government	6.3	−0.7	0.4	5.2	3.5	−1.2	4.3
Banks	−7.7	−8.0	91.5	4.9	24.2	20.0	10.2
Other sectors	9.8	3.9	62.6	22.7	13.8	−6.5	0.6
Total, Groups A Through C	*4.3*	*30.0*	*531.4*	*16.8*	*52.3*	*44.4*	*31.0*
D. Net Errors and Omissions	**−3.2**	**−2.8**	**−59.8**	**−15.8**	**−3.2**	**−7.6**	**−8.0**
Total, Groups A Through D	*1.1*	*27.2*	*471.7*	*1.0*	*49.1*	*36.7*	*22.9*
E. Reserves and Related Items	**−1.1**	**−27.2**	**−471.7**	**−1.0**	**−49.1**	**−36.7**	**−22.9**
Reserve assets	−1.1	−27.2	−471.7	−1.0	−49.1	−36.7	−23.0
Use of fund credit and loans	—	—	—	—	—	—	—
Exceptional financing	—	—	—	—	—	—	—
Conversion rate per U.S. dollar	**.7550**	**1,156.1**	**6.2703**	**45.726**	**1.75936**	**30.368**	**12.6360**

*Some totals do not add up because of rounding.

Source: International Monetary Fund, *Balance of Payments Statistics Yearbook* (Washington, D.C.: IMF, 2011).

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http://www.unctad-docs.org/files/UNCTAD-WIR2011-Full-en.pdf

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chapter 14

Foreign Exchange Markets and Exchange Rates

LEARNING GOALS:

After reading this chapter, you should be able to:

- Understand the meaning and functions of the foreign exchange market
- Know what the spot, forward, cross, and effective exchange rates are
- Understand the meaning of foreign exchange risks, hedging, speculation, and interest arbitrage

14.1 Introduction

The foreign exchange market is the market in which individuals, firms, and banks buy and sell foreign currencies or foreign exchange. The foreign exchange market for any currency—say, the U.S. dollar—is comprised of all the locations (such as London, Paris, Zurich, Frankfurt, Singapore, Hong Kong, Tokyo, and New York) where dollars are bought and sold for other currencies. These different monetary centers are connected electronically and are in constant contact with one another, thus forming a single international foreign exchange market.

Section 14.2 examines the functions of foreign exchange markets. Section 14.3 defines foreign exchange rates and arbitrage, and examines the relationship between the exchange rate and the nation's balance of payments. Section 14.4 defines spot and forward rates and discusses foreign exchange swaps, futures, and options. Section 14.5 then deals with foreign exchange risks, hedging, and speculation. Section 14.6 examines uncovered and covered interest arbitrage, as well as the efficiency of the foreign exchange market. Finally, Section 14.7 deals with the Eurocurrency, Eurobond, and Euronote markets. In the appendix, we derive the formula for the precise calculation of the covered interest arbitrage margin.

14.2 Functions of the Foreign Exchange Markets

By far the principal function of foreign exchange markets is the transfer of funds or purchasing power from one nation and currency to another. This is usually accomplished by an electronic transfer and increasingly through the Internet. With it, a domestic bank instructs its correspondent bank in a foreign monetary center to pay a specified amount of the local currency to a person, firm, or account.

The demand for foreign currencies arises when tourists visit another country and need to exchange their national currency for the currency of the country they are visiting, when a domestic firm wants to import from other nations, when an individual or firm wants to invest abroad, and so on. Conversely, a nation's supply of foreign currencies arises from foreign tourist expenditures in the nation, from export earnings, from receiving foreign investments, and so on. For example, suppose a U.S. firm exporting to the United Kingdom is paid in pounds sterling (the U.K. currency). The U.S. exporter will exchange the pounds for dollars at a commercial bank. The commercial bank will then sell these pounds for dollars to a U.S. resident who is going to visit the United Kingdom, to a U.S. firm that wants to import from the United Kingdom and pay in pounds, or to a U.S. investor who wants to invest in the United Kingdom and needs the pounds to make the investment.

Thus, a nation's commercial banks operate as *clearinghouses* for the foreign exchange demanded and supplied in the course of foreign transactions by the nation's residents. In the absence of this function, a U.S. importer needing British pounds, for instance, would have to locate a U.S. exporter with pounds to sell. This would be very time-consuming and inefficient and would essentially be equivalent to reverting to barter trade. Those U.S. commercial banks that find themselves with an oversupply of pounds will sell their excess pounds (through the intermediary of *foreign exchange brokers*) to commercial banks that happen to be short of pounds needed to satisfy their customers' demand. In the final analysis, then, a nation pays for its tourist expenditures abroad, its imports, its investments abroad, and so on with its foreign exchange earnings from tourism, exports, and the receipt of foreign investments.

If the nation's total demand for foreign exchange in the course of its foreign transactions exceeds its total foreign exchange earnings, the rate at which currencies exchange for one another will have to change (as explained in the next section) to equilibrate the total quantities demanded and supplied. If such an adjustment in the exchange rates were not allowed, the nation's commercial banks would have to borrow from the nation's central bank. The nation's central bank would then act as the "lender of last resort" and draw down its foreign exchange reserves (a balance-of-payments deficit of the nation). On the other hand, if the nation generated an excess supply of foreign exchange in the course of its business transactions with other nations (and if adjustment in exchange rates were not allowed), this excess supply would be exchanged for the national currency at the nation's central bank, thus increasing the nation's foreign currency reserves (a balance-of-payments surplus).

Thus, four *levels* of transactors or participants can be identified in foreign exchange markets. At the bottom, or at the first level, are such traditional users as tourists, importers, exporters, investors, and so on. These are the immediate users and suppliers of foreign currencies. At the next, or second, level are the commercial banks, which act as clearinghouses between users and earners of foreign exchange. At the third level are foreign exchange brokers, through whom the nation's commercial banks even out their foreign exchange inflows and outflows among themselves (the so-called *interbank or wholesale market*). Finally, at the fourth and highest level is the nation's central bank, which acts as the seller or buyer of last resort when the nation's total foreign exchange earnings and expenditures are unequal. The central bank then either draws down its foreign exchange reserves or adds to them.

Because of the special position of the U.S. dollar as an international currency as well as the national currency of the United States, U.S. importers and U.S. residents wishing to make investments abroad could pay in dollars. Then it would be U.K. exporters and investment recipients who would have to exchange dollars for pounds in the United Kingdom. Similarly, U.S. exporters and U.S. recipients of foreign investments may require payment in dollars. Then it would be U.K. importers or investors who would have to exchange pounds for dollars in London. This makes *foreign* monetary centers relatively larger than they otherwise might have been.

But the U.S. dollar is more than an international currency. It is a vehicle currency; that is, the dollar is also used for transactions that do not involve the United States at all, as, for example, when a Brazilian importer uses dollars to pay a Japanese exporter (see Case Study 14-1). The same is true of the euro, the newly established currency of the European Monetary Union or EMU. The United States receives a seignorage benefit when the dollar is used as a vehicle currency. This arises from and amounts to an interest-free loan from foreigners to the United States on the amount of dollars held abroad. More than 60 percent of the U.S. currency is now held abroad.

The Bank for International Settlements (BIS) in Basel, Switzerland, estimated that the total of foreign exchange trading or “turnover” for the world as a whole averaged $4.0 trillion *per day* in 2010, up from $3.3 trillion in 2007, $1.9 trillion in 2004, and $1.2 trillion in 2001. This is about 27 percent of the average *yearly* volume of world trade and of the U.S. gross domestic product (GDP) in 2010. Banks located in the United Kingdom

CASE STUDY 14-1 The U.S. Dollar as the Dominant International Currency

Today the U.S. dollar is the dominant international currency, serving as a unit of account, medium of exchange, and store of value not only for domestic transactions but also for private and official international transactions. The U.S. dollar replaced the British pound sterling after World War II as the dominant vehicle currency because of its more stable value, the existence of large and well-developed financial markets in the United States, and the very large size of the U.S. economy. Since its creation at the beginning of 1999, the euro (the common currency of 17 of the 27-member countries of the European Union) has become the second most important vehicle international currency (see Case Study 14-2).

Table 14.1 shows the relative importance of the dollar, the euro, and other major currencies in the world economy in 2010. The table shows that 42.5 percent of foreign exchange trading was in dollars, as compared with 19.6 percent in euro, 9.5 percent in Japanese yen, and smaller percentages in other currencies. Table 14.1 also shows that 58.2 percent of international bank loans, 38.2 percent of international bond offerings, and 52.0 percent of international trade invoicing were denominated in U.S. dollars. Also, 61.5 percent of foreign exchange reserves were held in U.S. dollars, as compared with 26.2 percent in euro, and much smaller percentages for the yen and other currencies. Although the U.S. dollar has gradually lost its role as the *sole* vehicle currency that it enjoyed since the end of World War II, it still remains the dominant vehicle currency in the world today.

(continued)

CASE STUDY 14-1 Continued

TABLE 14.1. Relative International Importance of Major Currencies in 2010 (in Percentages)

	Foreign Exchange Trading[a]	International Bank Loans[a]	International Bond Offering[a]	Trade Invoicing[b]	Foreign Exchange Reserves[c]
U.S. dollar	42.5	58.2	38.2	52.0	61.5
Euro	19.6	21.4	45.1	24.8	26.2
Japanese yen	9.5	3.0	3.8	4.7	3.8
Pound sterling	6.5	5.5	8.0	5.4	4.0
Swiss franc	3.2	2.1	1.5	*na*	0.1
Other currencies	18.7	9.8	4.4	13.1	4.4

[a]Bank of International Settlements, *Triennial Central Bank Survey* (Basel, Switzerland: BIS, March 2010) and BIS data set.
[b]P. Bekx, ''The Implications of the Introduction of the Euro for Non-EU Countries,'' *Euro Paper No. 26*, July 1998. Data are for 1995. More recent data are not available.
[c]International Monetary Fund, *Annual Report* (Washington, D.C.: IMF, 2011).

accounted for nearly 37 percent of all foreign exchange market turnover, followed by the United States with about 18 percent, Japan with about 6 percent, Singapore, Switzerland, and Hong Kong SAR each with about 5 percent, Australia with about 4 percent, and the rest with other smaller markets. Most of these foreign exchange transactions take place through debiting and crediting bank accounts rather than through actual currency exchanges. For example, a U.S. importer will pay for EMU goods by debiting his or her account at a U.S. bank. The latter will then instruct its correspondent bank in an EMU country to credit the account of the EMU exporter with the euro value of the goods.

Another function of foreign exchange markets is the credit function. Credit is usually needed when goods are in transit and also to allow the buyer time to resell the goods and make the payment. In general, exporters allow 90 days for the importer to pay. However, the exporter usually discounts the importer's obligation to pay at the foreign department of his or her commercial bank. As a result, the exporter receives payment right away, and the bank will eventually collect the payment from the importer when due. Still another function of foreign exchange markets is to provide the facilities for hedging and speculation (discussed in Section 14.5). Today, about 90 percent of foreign exchange trading reflects purely financial transactions and only about 10 percent trade financing.

With electronic transfers, foreign exchange markets have become truly global in the sense that currency transactions now require only a few seconds to execute and can take place 24 hours per day. As banks end their regular business day in San Francisco and Los Angeles, they open in Singapore, Hong Kong, Sydney, and Tokyo; by the time the latter banks wind down their regular business day, banks open in London, Paris, Zurich, Frankfurt, and Milan; and before the latter close, New York and Chicago banks open.

Case Study 14-1 examines the U.S. dollar as the dominant vehicle currency, whereas Case Study 14-2 discusses the birth of the euro, which has quickly become the second most important vehicle currency.

CASE STUDY 14-2 The Birth of a New Currency: The Euro

On January 1, 1999, the euro (€) came into existence as the single currency of 11 of the then 15 member countries of the European Union (Austria, Belgium, Germany, Finland, France, Ireland, Italy, Luxembourg, Spain, Portugal, and the Netherlands). Greece was admitted at the beginning of 2001, Slovenia in 2007, Cyprus and Malta in 2008, Slovakia in 2009, and Estonia in 2011—making the number of EMU countries in the *Eurozone* equal to 17 (out of the 27 members of the European Union or EU in 2011). Britain, Sweden, and Denmark chose not to participate, but reserved the right to join later. This was the first time that a group of sovereign nations voluntarily gave up their currency in favor of a common currency, and it ranks as one of the most important economic events of the postwar period.

From the start, the euro became an important international currency because the European Monetary Union or EMU (1) is as large an economic and trading unit as the United States; (2) has a large, well-developed, and growing financial market, which is increasingly free of controls; and (3) has a good inflation performance that will keep the value of the euro stable. But it is not likely that the euro will displace the U.S. dollar as the leading international or vehicle currency any time soon because (1) most primary commodities are priced in dollars, and this is likely to remain the case for some time to come; (2) most non-EMU countries are likely to continue to use the dollar for most of their international transactions for the foreseeable future, with the exception of the former communist nations in Central and Eastern Europe (which are candidates for admission into the European Monetary Union and may even adopt the euro before then) and the former French colonies in West and Central Africa; and (3) sheer inertia favors the incumbent (the dollar).

The most likely situation will be that the euro will share the leading position with the dollar during this decade and also with the renminbi or yuan, the currency of China, after that. Although still officially inconvertible, China has already started rapidly "internationalizing" its currency by developing an offshore market in the currency and encouraging the use of renminbi in settling and invoicing international trade transactions. The World Bank predicted that by 2025 the euro and the renminbi will become as important international or vehicle currencies as the dollar in a new "multi-currency" international monetary system.

Sources: D. Salvatore, "The Euro: Expectations and Performance," *Eastern Economic Journal*, Winter 2002, pp. 121–136; D. Salvatore, "Euro," *Princeton Encyclopedia of the World Economy* (Princeton, N.J.: Princeton University Press, 2008), pp. 350–352; World Bank, *Multipolarity: The New Global Economy* (Washington, D.C., 2011), pp. 139–142; and D. Salvatore, "Exchange Rate Misalignments and the International Monetary System," *Journal of Policy Modeling*, July/August 2012, pp. 594–604.

14.3 Foreign Exchange Rates

In this section, we first define exchange rates and show how they are determined under a flexible exchange rate system. Then we explain how exchange rates between currencies are equalized by arbitrage among different monetary centers. Finally, we show the relationship between the exchange rate and the nation's balance of payments.

14.3A Equilibrium Foreign Exchange Rates

Assume for simplicity that there are only two economies, the United States and the European Monetary Union (EMU), with the dollar ($) as the domestic currency and the euro (€) as

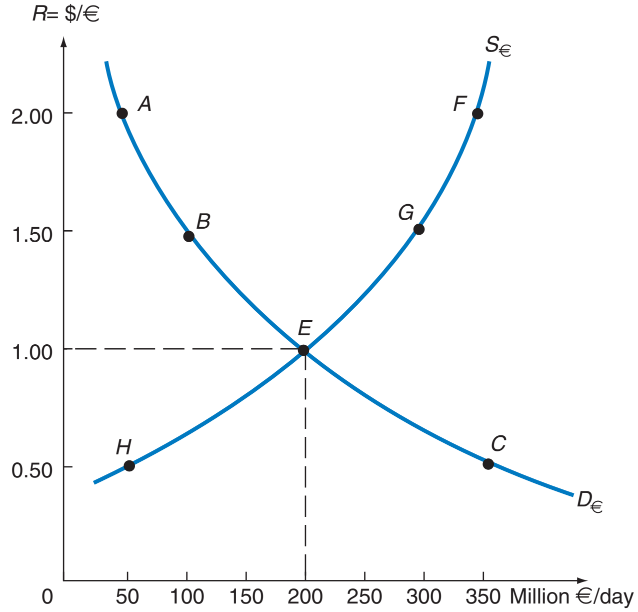


FIGURE 14.1. The Exchange Rate under a Flexible Exchange Rate System.
The vertical axis measures the dollar price of the euro (R = \$/€), and the horizontal axis measures the quantity of euros. With a flexible exchange rate system, the equilibrium exchange rate is $R = 1$, at which the quantity demanded and the quantity supplied are equal at €200 million per day. This is given by the intersection at point E of the U.S. demand and supply curves for euros. At a higher exchange rate, a surplus of euros would result that would tend to lower the exchange rate toward the equilibrium rate. At an exchange rate lower than $R = 1$, a shortage of euros would result that would drive the exchange rate up toward the equilibrium level.

the foreign currency. The exchange rate (R) between the dollar and the euro is equal to the number of dollars needed to purchase one euro. That is, R = \$/€. For example, if R = \$/€ = 1, this means that one dollar is required to purchase one euro.

Under a flexible exchange rate system of the type we have today, the dollar price of the euro (R) is determined, just like the price of any commodity, by the intersection of the market demand and supply curves for euros. This is shown in Figure 14.1, where the vertical axis measures the dollar price of the euro, or the exchange rate, R = \$/€, and the horizontal axis measures the quantity of euros. The market demand and supply curves for euros intersect at point E, defining the equilibrium exchange rate of $R = 1$, at which the quantity of euros demanded and the quantity supplied are equal at €200 million per day. At a higher exchange rate, the quantity of euros supplied exceeds the quantity demanded, and the exchange rate will fall toward the equilibrium rate of $R = 1$. At an exchange rate lower than $R = 1$, the quantity of euros demanded exceeds the quantity supplied, and the exchange rate will be bid up toward the equilibrium rate of $R = 1$. If the exchange rate were not allowed to rise to its equilibrium level (as under the fixed exchange rate system that prevailed until March 1973), then either restrictions would have to be imposed on the demand for euros of U.S. residents or the U.S. central bank (the Federal Reserve System) would have to fill or satisfy the excess demand for euros out of its international reserves.

The U.S. demand for euros is negatively inclined, indicating that the lower the exchange rate *(R)*, the greater the quantity of euros demanded by U.S. residents. The reason is that the lower the exchange rate (i.e., the fewer the number of dollars required to purchase a euro), the cheaper it is for U.S. residents to import from and to invest in the European Monetary Union, and thus the greater the quantity of euros demanded by U.S. residents. On the other hand, the U.S. supply of euros is usually positively inclined (see Figure 14.1), indicating that the higher the exchange rate *(R)*, the greater the quantity of euros earned by U.S. residents and supplied to the United States. The reason is that at higher exchange rates, EMU residents receive more dollars for each of their euros. As a result, they find U.S. goods and investments cheaper and more attractive and spend more in the United States, thus supplying more euros to the United States.

If the U.S. demand curve for euros shifted up (for example, as a result of increased U.S. tastes for EMU goods) and intersected the U.S. supply curve for euros at point G (see Figure 14.1), the equilibrium exchange rate would be $R = 1.50$, and the equilibrium quantity of euros would be €300 million per day. The dollar is then said to have depreciated since it now requires \$1.50 (instead of the previous \$1) to purchase one euro. Depreciation thus refers to an increase in the domestic price of the foreign currency. Conversely, if the U.S. demand curve for euros shifted down so as to intersect the U.S. supply curve for euros at point H (see Figure 14.1), the equilibrium exchange rate would fall to $R = 0.5$ and the dollar is said to have appreciated (because fewer dollars are now required to purchase one euro). Appreciation thus refers to a decline in the domestic price of the foreign currency. An appreciation of the domestic currency means a depreciation of the foreign currency and vice versa. Shifts in the U.S. supply curve for euros would similarly affect the equilibrium exchange rate and equilibrium quantity of euros (these are left as end-of-chapter problems).

The exchange rate could also be defined as the foreign currency price of a unit of the domestic currency. This is the inverse, or reciprocal, of our previous definition. Since in the case we examined previously, the dollar price of the euro is $R = 1$, its inverse is also 1. If the dollar price of the euro were instead $R = 2$, then the euro price of the dollar would be $1/R = 1/2$, or it would take half a euro to purchase one dollar. Although this definition of the exchange rate is sometimes used, we will use the previous one, or the dollar price of the euro *(R)*, unless clearly stated to the contrary. In the real world, the particular definition of the exchange rate being used is generally spelled out to avoid confusion (see Case Study 14-3).

Finally, while we have dealt with only two currencies for simplicity, in reality there are numerous exchange rates, one between any pair of currencies. Thus, besides the exchange rate between the U.S. dollar and the euro, there is an exchange rate between the U.S. dollar and the British pound (£), between the U.S. dollar and the Swiss franc, the Canadian dollar and the Mexican peso, the British pound and the euro, the euro and the Swiss franc, and between each of these currencies and the Japanese yen. Once the exchange rate between each of a pair of currencies with respect to the dollar is established, however, the exchange rate between the two currencies themselves, or cross-exchange rate, can easily be determined. For example, if the exchange rate *(R)* were 2 between the U.S. dollar and the British pound and 1.25 between the dollar and the euro, then the exchange rate between the pound and the euro would be 1.60 (i.e., it takes €1.6 to purchase 1£). Specifically,

$$R = €/£ = \frac{\$ \text{ value of } £}{\$ \text{ value of } €} = \frac{2}{1.25} = 1.60$$

CASE STUDY 14-3 Foreign Exchange Quotations

Table 14.2 gives the exchange or spot rate for various currencies with respect to the U.S. dollar for Friday May 25, 2012—defined first as the dollar price of the foreign currency (often referred to as in *direct* or "American" terms) and then as the foreign currency price of the dollar (i.e., in *indirect* or "European" terms). For example, next to the Euro area, we find that the direct spot rate was \$1.2518/€1. On the same line, we find that the indirect or euro price of the dollar was €0.7988/\$1. The last column of the table, headed "U.S. \$ vs. YTD chg (%)," shows the percentage change in the exchange rate, year to date (YTD)—that is, from the beginning of the year. For example, the table shows that the dollar appreciated by 3.5 percent vis-à-vis the euro from the beginning of 2012 to May 25, 2012. Note that the main exchange rate table also gives the one-month, three-month, and six-month forward rate for the Australian dollar, the Japanese yen, the Swiss franc, and the British pound. These are discussed in Section 14.4A.

TABLE 14.2. Foreign Exchange Quotation, May 25, 2012

Currencies
U.S.-dollar foreign-exchange rates in late New York trading

Country/currency	—Thurs— in US$	—Thurs— per US$	US$ vs, YTD chg (%)
Americas			
Argentina peso*	.2239	4.4668	3.7
Brazil real	.5031	1.9877	6.5
Canada dollar	.9716	1.0293	0.8
Chile peso	.001965	509.00	−2.1
Colombia peso	.0005462	1831.00	−5.6
Ecuador US dollar	1	1	unch
Mexico peso*	.0713	14.0238	0.6
Peru new sol	.3711	2.695	−0.1
Uruguay peso†	.04975	20.1005	1.5
Venezuela b.fuerte	.229885	4.3500	unch
Asia-Pacific			
Australian dollar	.9759	1.0247	4.6
1-mos forward	.9730	1.0278	4.3
3-mos forward	.9681	1.0330	4.2
6-mos forward	.9618	1.0398	4.1
China yuan	.1578	6.3372	0.3
Hong Kong dollar	.1288	7.7634	unch
India rupee	.01806	55.375	4.4
Indonesia rupiah	.0001058	9450	4.6
Japan yen	.012549	79.68	3.6
1-mos forward	.012552	79.67	3.5
3-mos forward	.012561	79.61	3.6
6-mos forward	.012581	79.48	3.6
Malaysia ringglt	.3171	3.1532	−0.8
New Zealand dollar	.7537	1.3267	3.2
Pakistan rupee	.01086	92.055	2.5
Philippines peso	.0228	43.770	−0.2
Singapore dollar	.7804	1.2814	−1.2
South Korea won	.0008432	1185.90	2.2
Taiwan dollar	.03374	29.640	−2.1
Thailand baht	.03157	31.676	0.2
Vietnam dong	.00004796	20850	−0.9
Europe			
Czech Rep. koruna**	.04933	20.273	2.6
Denmark krone	.1685	5.9355	3.5
Euro area euro	1.2518	.7988	3.5
Hungary forint	.004176	239.44	−1.5
Norway krone	.1662	6.0162	0.7
Poland zloty	.2868	3.4869	1.2
Russia ruble‡	.03119	32.064	−0.3
Sweden krona	.1393	7.1766	4.3
Switzerland franc	1.0422	.9595	2.4
1-mos forward	1.0427	.9590	2.3
3-mos forward	1.0443	.9576	2.3
6-mos forward	1.0472	.9549	2.3
Turkey lira**	.5407	1.8494	−3.5
UK pound	1.5660	.6386	−0.8
1-mos forward	1.5657	.6387	−0.8
3-mos forward	1.5652	.6389	−0.8
6-mos forward	1.5647	.6391	−0.9
Middle East/Africa			
Bahrain dinar	2.6532	.3769	unch
Egypt pound*	.1656	6.0372	−0.2
Israel shekel	.2593	3.8559	1.2
Jordan dinar	1.4119	.7083	−0.2
Kuwait dinar	3.5677	.2803	0.8
Lebanon pound	.0006651	1503.45	−0.1
Saudi Arabia riyal	.2666	3.7509	unch
South Africa rand	.1190	8.4028	3.9
UAE dirham	.2723	3.6730	unch

Source : *ICAPplc*.

*Floating rate †Financial §Government rate ‡Russian Central Bank rate **Commercial rate

Source: Reprinted by permission of the *Wall Street Journal*, Since over time a currency can depreciate with respect to some currencies and appreciate against others, an effective exchange rate is calculated. This is a weighted average of the exchange rates between the domestic currency and that of the nation's most important trade partners, with weights given by the relative importance of the nation's trade with each of these trade partners (see Section 14.5A). Finally, we must also distinguish between the nominal exchange rate (the one we have been discussing) and the real exchange rate (to be discussed in Chapter 15).

14.3B Arbitrage

The exchange rate between any two currencies is kept the same in different monetary centers by arbitrage. This refers to the purchase of a currency in the monetary center where it is cheaper, for immediate resale in the monetary center where it is more expensive, in order to make a profit.

For example, if the dollar price of the euro was \$0.99 in New York and \$1.01 in Frankfurt, an arbitrageur (usually a foreign exchange dealer of a commercial bank) would purchase euros at \$0.99 in New York and immediately resell them in Frankfurt for \$1.01, thus realizing a profit of \$0.02 per euro. While the profit per euro transferred seems small, on €1 million the profit would be \$20,000 for only a few minutes work. From this profit must be deducted the cost of the electronic transfer and the other costs associated with arbitrage. Since these costs are very small, we shall ignore them here.

As arbitrage takes place, however, the exchange rate between the two currencies tends to be equalized in the two monetary centers. Continuing our example, we see that arbitrage increases the demand for euros in New York, thereby exerting an upward pressure on the dollar price of euros in New York. At the same time, the sale of euros in Frankfurt increases the supply of euros there, thus exerting a downward pressure on the dollar price of euros in Frankfurt. This continues until the dollar price of the euro quickly becomes equal in New York and Frankfurt (say at \$1 = €1), thus eliminating the profitability of further arbitrage.

When only two currencies and two monetary centers are involved in arbitrage, as in the preceding example, we have *two-point arbitrage*. When three currencies and three monetary centers are involved, we have *triangular*, or *three-point, arbitrage*. While triangular arbitrage is not very common, it operates in the same manner to ensure *consistent indirect*, or *cross, exchange rates* between the three currencies in the three monetary centers. For example, suppose exchange rates are as follows:

$$\begin{aligned} \$1 &= €1 \text{ in New York} \\ €1 &= £0.64 \text{ in Franfurt} \\ £0.64 &= \$1 \text{ in London} \end{aligned}$$

These cross rates are consistent because

$$\$1 = €1 = £0.64$$

and there is no possibility of profitable arbitrage. However, if the dollar price of the euro were \$0.96 in New York, with the other exchange rates as indicated previously, then it would pay to use \$0.96 to purchase €1 in New York, use the €1 to buy £0.64 in Frankfurt, and exchange the £0.64 for \$1 in London, thus realizing a \$0.04 profit on each euro so transferred. On the other hand, if the dollar price of the euro was \$1.04 in New York, it would pay to do just the opposite—that is, use \$1 to purchase £0.64 in London, exchange the £0.64 for €1 in Frankfurt, and exchange the €1 for \$1.04 in New York, thus making a profit of \$0.04 on each euro so transferred.

As in the case of two-point arbitrage, triangular arbitrage increases the demand for the currency in the monetary center where the currency is cheaper, increases the supply of the currency in the monetary center where the currency is more expensive, and quickly eliminates inconsistent cross rates and the profitability of further arbitrage. As a result, arbitrage quickly equalizes exchange rates for each pair of currencies and results in consistent cross rates among all pairs of currencies, thus unifying all international monetary centers into a single market.

14.3c The Exchange Rate and the Balance of Payments

We can examine the relationship between the exchange rate and the nation's balance of payments with Figure 14.2, which is identical to Figure 14.1 except for the addition of the new demand curve for euros labeled $D'_€$. We have seen in Chapter 13 that the U.S. demand for euros ($D_€$) arises from the U.S. demand for imports of goods and services from the European Union, from U.S. unilateral transfers to the European Union, and from U.S.

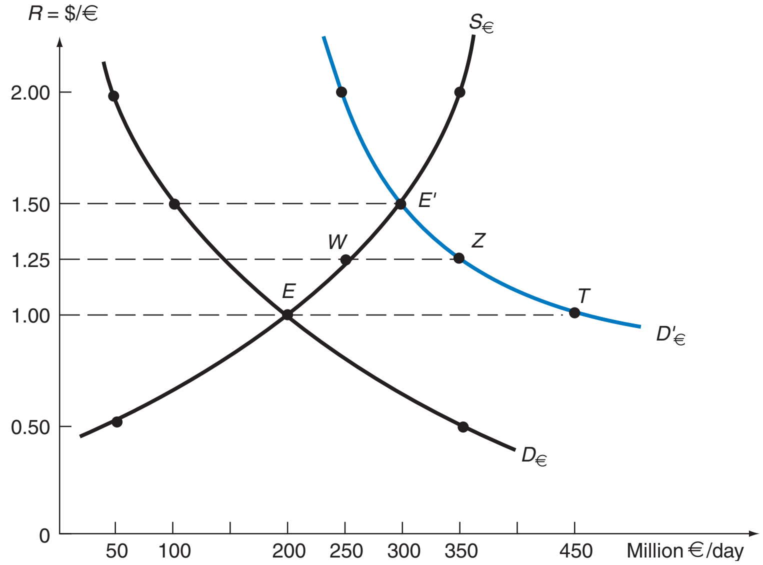


FIGURE 14.2. Disequilibrium under a Fixed and a Flexible Exchange Rate System.
With $D_€$ and $S_€$, equilibrium is at point E at the exchange rate of R = \$/€ = 1, at which the quantities of euros demanded and supplied are equal at €200 million per day. If $D_€$ shifted up to $D'_€$, the United States could maintain the exchange rate at $R = 1$ by satisfying (out of its official euro reserves) the excess demand of €250 million per day (*TE* in the figure). With a freely flexible exchange rate system, the dollar would depreciate until $R = 1.50$ (point E' in the figure). If, on the other hand, the United States wanted to limit the depreciation of the dollar to $R = 1.25$ under a managed float, it would have to satisfy the excess demand of €100 million per day (*WZ* in the figure) out of its official euro reserves.

investments in the European Monetary Union (a capital outflow from the United States). These are the autonomous debit transactions of the United States that involve payments to the European Monetary Union.

On the other hand, the supply of euros ($S_€$) arises from U.S. exports of goods and services to the European Monetary Union, from unilateral transfers received from the European Monetary Union, and from the EMU investments in the United States (a capital inflow to the United States). These are the autonomous credit transactions of the United States that involve payments from the European Monetary Union. (We are assuming for simplicity that the United States and the European Monetary Union are the only two economies in the world and that all transactions between them take place in euros.)

With $D_€$ and $S_€$, the equilibrium exchange rate is $R = \$/€ = 1$ (point E in Figure 14.2), at which €200 million are demanded and supplied per day (exactly as in Figure 14.1). Now suppose that for whatever reason (such as an increase in U.S. tastes for EMU products) the U.S. autonomous demand for euros shifts up to $D'_€$. If the United States wanted to maintain the exchange rate fixed at $R = 1$, U.S. monetary authorities would have to satisfy the excess demand for euros of TE (€250 million per day in Figure 14.2) out of its official reserve holdings of euros. Alternatively, EMU monetary authorities would have to purchase dollars (thus adding to their official dollar reserves) and supply euros to the foreign exchange market to prevent an appreciation of the euro (a depreciation of the dollar). In either case, the U.S. official settlements balance would show a deficit of €250 million ($250 million at the official exchange rate of $R = 1$) per day, or €91.25 billion ($91.25 billion) per year.

If, however, the United States operated under a freely flexible exchange rate system, the exchange rate would rise (i.e., the dollar would depreciate) from $R = 1.00$ to $R = 1.50$, at which the quantity of euros demanded (€300 million per day) exactly equals the quantity supplied (point E' in Figure 14.2). In this case, the United States would not lose any of its official euro reserves. Indeed, international reserves would be entirely unnecessary under such a system. The tendency for an excess demand for euros on autonomous transactions would be completely eliminated by a sufficient depreciation of the dollar with respect to the euro.

However, under a managed floating exchange rate system of the type in operation since 1973, U.S. monetary authorities can intervene in foreign exchange markets to moderate the depreciation (or appreciation) of the dollar. In the preceding example, the United States might limit the depreciation of the dollar to $R = 1.25$ (instead of letting the dollar depreciate all the way to $R = 1.50$ as under a freely fluctuating exchange rate system). The United States could do this by supplying to the foreign exchange market the excess demand for euros of WZ, or €100 million per day, out of its official euro reserves (see the figure). Under such a system, part of the potential deficit in the U.S. balance of payments is covered by the loss of official reserve assets of the United States, and part is reflected in the form of a depreciation of the dollar. Thus, we cannot now measure the deficit in the U.S. balance of payments by simply measuring the loss of U.S. international reserves or by the amount of the net credit balance in the official reserve account of the United States. Under a managed float, the loss of official reserves only indicates the degree of official intervention in foreign exchange markets to influence the level and movement of exchange rates, and not the balance-of-payments deficit.

For this reason, since 1976 the United States has suspended the calculation of the balance-of-payments deficit or surplus. The statement of international transactions does not even show the net balance on the official reserve account (although it can be easily calculated) in order to be neutral and not to focus undue attention on such a balance, in view of the present system of floating but managed exchange rates (see Table 13.1).

The concept and measurement of international transactions and the balance of payments are still very important and useful, however, for several reasons. First, as pointed out in Chapter 13, the flow of trade provides the link between international transactions and the national income. (This link is examined in detail in Chapter 17.) Second, many developing countries still operate under a fixed exchange rate system and peg their currency to a major currency, such as the U.S. dollar and the euro, or to SDRs. Third, the International Monetary Fund requires all member nations to report their balance-of-payments statement annually to it (in the specific format shown in Section A13.1). Finally, and perhaps more important, while not measuring the deficit or surplus in the balance of payments, the balance of the official reserve account gives an indication of the degree of intervention by the nation's monetary authorities in the foreign exchange market to reduce exchange rate volatility and to influence exchange rate levels.

14.4 Spot and Forward Rates, Currency Swaps, Futures, and Options

In this section we distinguish between spot and forward exchange rates and examine their significance. Then we discuss foreign exchange swaps, futures, and options and their uses.

14.4A Spot and Forward Rates

The most common type of foreign exchange transaction involves the payment and receipt of the foreign exchange within two bussiness days after the day the transaction is agreed upon. The two-day period gives adequate time for the parties to send instructions to debit and credit the appropriate bank accounts at home and abroad. This type of transaction is called a *spot transaction*, and the exchange rate at which the transaction takes place is called the spot rate. The exchange rate $R = \$/€ = 1$ in Figure 14.1 is a spot rate.

Besides spot transactions, there are forward transactions. A *forward transaction* involves an agreement today to buy or sell a specified amount of a foreign currency at a specified future date at a rate agreed upon today (the forward rate). For example, I could enter into an agreement today to purchase €100 three months from today at $1.01 = €1. Note that no currencies are paid out at the time the contract is signed (except for the usual 10 percent security margin). After three months, I get the €100 for $101, regardless of what the spot rate is at that time. The typical forward contract is for one month, three months, or six months, with three months the most common (see Case Study 14-3). Forward contracts for longer periods are not as common because of the great uncertainties involved. However, forward contracts can be renegotiated for one or more periods when they become due. In what follows, we will deal exclusively with three-month forward contracts and rates, but the procedure would be the same for forward contracts of different duration.

The equilibrium forward rate is determined at the intersection of the market demand and supply curves of foreign exchange *for future delivery*. The demand for and supply of forward foreign exchange arise in the course of hedging, from foreign exchange speculation, and from covered interest arbitrage. These, as well as the close relationship between the spot rate and the forward rate, are discussed next in Sections 14.5 and 14.6. All that needs to be said here is that, at any point in time, the forward rate can be equal to, above, or below the corresponding spot rate.

If the forward rate is below the present spot rate, the foreign currency is said to be at a forward discount with respect to the domestic currency. However, if the forward rate is above the present spot rate, the foreign currency is said to be at a forward premium. For example, if the spot rate is \$1 = €1 and the three-month forward rate is \$0.99 = €1, we say that the euro is at a three-month forward discount of 1 cent or 1 percent (or at a 4 percent forward discount per year) with respect to the dollar. On the other hand, if the spot rate is still \$1 = €1 but the three-month forward rate is instead \$1.01 = €1, the euro is said to be at a forward premium of 1 cent or 1 percent for three months, or 4 percent per year.

Forward discounts *(FD)* or premiums *(FP)* are usually expressed as percentages per year from the corresponding spot rate and can be calculated formally with the following formula:

$$FD \text{ or } FP = \frac{FR - SR}{SR} \times 4 \times 100$$

where FR is the forward rate and SR is the spot rate (what we simply called R in the previous section). The multiplication by 4 is to express the $FD(-)$ or $FP(+)$ on a yearly basis, and the multiplication by 100 is to express the FD or FP in percentages. Thus, when the spot rate of the pound is $SR = \$1.00$ and the forward rate is $FR = \$0.99$, we get

$$FD = \frac{\$0.99 - \$1.00}{\$1.00} \times 4 \times 100 = \frac{-\$0.01}{\$1.00} \times 4 \times 100$$
$$= -0.01 \times 4 \times 100 = -4\%$$

the same as found earlier without the formula. Similarly, if $SR = \$1$ and $FR = \$1.01$:

$$FP = \frac{\$1.01 - \$1.00}{\$1.00} \times 4 \times 100 = \frac{\$0.01}{\$1.00} \times 4 \times 100$$
$$= 0.01 \times 4 \times 100 = +4\%$$

14.4B Foreign Exchange Swaps

A foreign exchange swap refers to a spot sale of a currency combined with a forward repurchase of the same currency—as part of a single transaction. For example, suppose that Citibank receives a \$1 million payment today that it will need in three months, but in the meantime it wants to invest this sum in euros. Citibank would incur lower brokerage fees by swapping the \$1 million into euros with Frankfurt's Deutsche Bank as part of a single transaction or deal, instead of selling dollars for euros in the spot market today and at the same time repurchasing dollars for euros in the forward market for delivery in three months—in two separate transactions. The *swap rate* (usually expressed on a yearly basis) is the difference between the spot and forward rates in the currency swap.

Most interbank trading involving the purchase or sale of currencies for future delivery is done not by forward exchange contracts alone but combined with spot transactions in the form of foreign exchange swaps. In April 2010, there were $1,765 billion worth of foreign exchange swaps outstanding. These represented 44 percent of total interbank currency trading. Spot transactions were $1,490 billion or 37 percent of the total. Thus, the foreign exchange market is dominated by the foreign exchange swap and spot markets.

14.4c Foreign Exchange Futures and Options

An individual, firm, or bank can also purchase or sell foreign exchange futures and options. Trading in foreign exchange futures was initiated in 1972 by the International Monetary Market (IMM) of the Chicago Mercantile Exchange (CME). A foreign exchange futures is a forward contract for standardized currency amounts and selected calendar dates traded on an organized market (exchange). The currencies traded on the IMM are the Japanese yen, the Canadian dollar, the British pound, the Swiss franc, the Australian dollar, the Mexican peso, and the euro.

International Monetary Market trading is done as contracts of standard size. For example, the IMM Japanese yen contract is for ¥12.5 million, the Canadian dollar contract is for C$100,000, the pound contract is for £62,500, and the euro contract is for €125,000. Only four dates per year are available: the third Wednesday in March, June, September, and December (see Case Study 14-4). The IMM imposes a daily limit on exchange rate fluctuations. Buyers and sellers pay a brokerage commission and are required to post a security deposit or margin (about 4 percent of the value of the contract). A market similar to the IMM is the NYSE Euronext Liffe and the Frankfurt-based Eurex.

The *futures market* differs from a forward market in that in the futures market only a few currencies are traded; trades occur in standardized contracts only, for a few specific delivery dates, and are subject to daily limits on exchange rate fluctuations; and trading takes place only in a few geographical locations, such as Chicago, New York, London, Frankfurt, and Singapore. Futures contracts are usually for smaller amounts than forward contracts and thus are more useful to small firms than to large ones but are somewhat more expensive. Futures contracts can also be sold at any time up until maturity on an organized futures market, while forward contracts cannot. While the market for currency futures is small compared with the forward market, it has grown very rapidly, especially in recent years. (The value of currency futures outstanding was about $475 billion in April 2010). The two markets are also connected by arbitrage when prices differ.

Since 1982, individuals, firms, and banks have also been able to buy foreign exchange options (in Japanese yen, Canadian dollars, British pounds, Swiss francs, and euros) on the Philadelphia Stock Exchange, the Chicago Mercantile Exchange (since 1984), or from a bank. A foreign exchange option is a contract giving the purchaser the right, but not the obligation, to buy (a *call option*) or to sell (a *put option*) a standard amount of a traded currency on a stated date (the *European option*) or at any time before a stated date (the *American option*) and at a stated price (the *strike* or *exercise price*). Foreign exchange options are in standard sizes equal to those of futures IMM contracts. The buyer of the option has the choice to purchase or forego the purchase if it turns out to be unprofitable. The seller of the option, however, must fulfill the contract if the buyer so desires. The buyer pays the seller a premium (the option price) ranging from 1 to 5 percent of the contract's value for this privilege when he or she enters the contract. About $207 billion of currency options were outstanding in April 2010.

CASE STUDY 14-4 Size, Currency, and Geographic Distribution of the Foreign Exchange Market

Table 14.3 gives data on the size, currency, and geographical distribution of the foreign exchange market in 2010. The table shows that average daily spot transactions amounted to $1,490 billion or 37.4 percent of the total market turnover, outright forwards (forward transactions or futures) were $475 billion or 11.9 percent of the total, foreign exchange swaps were $1,765 billion or 44.3 percent, currency swaps (foreign exchange derivatives) were $43 billion or 1.1 percent, and options and other products were $207 billion or 5.2 percent, for a grand total foreign exchange market of $3,981 billion in 2010. The table also shows that the share of the U.S. dollar was more than twice that of the euro and more than four that of the Japanese yen and more than six times that of the British pound (the two currencies most used after the dollar and the euro). The United Kingdom (mostly London) had the largest share of the market with 36.7 percent followed by the United States (mostly New York, Chicago, and Philadelphia) with 17.9 percent share.

TABLE 14.3. Average Daily Global Foreign Exchange Market Turnover, Currency, and Geographic Distribution in 2010

Market Turnover[a]			Currency Distribution		Geographic Distribution	
	Value (billion $)	% of Total	Currency	% Share[b]	Nation	% Share
Spot transactions	1, 490	37.4	U.S. dollar	84.9	United Kingdom	36.7
Outright forwards	475	11.9	Euro	39.1	United States	17.9
Foreign exchange swaps	1, 765	44.3	Japanese yen	19.0	Japan	6.2
Currency swaps	43	1.1	British pound	12.9	Singapore	5.3
Options and other products	207	5.2	Australian dollar	7.6	Switzerland	5.2
Total	3, 981	100.0	Swiss franc	6.4	Hong Kong	4.7
			Canadian dollar	5.3	Australia	3.8
			Hong Kong dollar	2.4	France	3.0
			Other	22.4	Other	17.2
			Total	200.0	Total	100.0

[a] Daily averages in April, in billions of U.S. dollars; total does not add up because of rounding.
[b] Total market shares sum to 200 percent rather than to 100 percent because each transaction involves two currencies.
Source: Bank for International Settlements, *Triennial Central Bank Survey* (Basel: BIS), December 2010.

In contrast, neither forward contracts nor futures are options. Although forward contracts can be reversed (e.g., a party can sell a currency forward to neutralize a previous purchase) and futures contracts can be sold back to the futures exchange, both must be exercised (i.e., both contracts must be honored by both parties on the delivery date). Thus, options are less flexible than forward contracts, but in some cases they may be more useful. For example, an American firm making a bid to take over an EMU firm may be required to promise to pay a specified amount in euros. Since the American firm does not know if its bid will be successful, it will purchase an option to buy the euros that it would need and will exercise the option if the bid is successful. Case Study 14-4 gives the average daily distribution of global foreign exchange market turnover by instrument, by currency, and by geographical location.

14.5 Foreign Exchange Risks, Hedging, and Speculation

In this section, we examine the meaning of foreign exchange risks and how they can be avoided or covered by individuals and firms whose main business is not speculation. We then discuss how speculators attempt to earn a profit by trying to anticipate future foreign exchange rates.

14.5A Foreign Exchange Risks

Through time, a nation's demand and supply curves for foreign exchange shift, causing the spot (and the forward) rate to vary frequently. A nation's demand and supply curves for foreign exchange shift over time as a result of changes in tastes for domestic and foreign products in the nation and abroad, different growth and inflation rates in different nations, changes in relative rates of interest, changing expectations, and so on.

For example, if U.S. tastes for EMU products increase, the U.S. demand for euros increases (the demand curve shifts up), leading to a rise in the exchange rate (i.e., a depreciation of the dollar). On the other hand, a lower rate of inflation in the United States than in the European Monetary Union leads to U.S. products becoming cheaper for EMU residents. This tends to increase the U.S. supply of euros (the supply curve shifts to the right) and causes a decline in the exchange rate (i.e., an appreciation of the dollar). Or simply the expectation of a stronger dollar may lead to an appreciation of the dollar. In short, in a dynamic and changing world, exchange rates frequently vary, reflecting the constant change in the numerous economic forces simultaneously at work.

Figure 14.3 shows the great variation in exchange rates of the U.S. dollar with respect to the Japanese yen, the euro, the British pound, and the Canadian dollar from 1971 to 2005. Note that the exchange rate is here defined from the foreign nation's point of view (i.e., it is the foreign-currency price of the U.S. dollar), so that an increase in the exchange rate refers to a depreciation of the foreign currency (it takes more units of the foreign currency to purchase one dollar), while a reduction in the exchange rate refers to an appreciation of the foreign currency (and depreciation of the dollar).

The first panel of Figure 14.3 shows the sharp appreciation of the Japanese yen with respect to the U.S. dollar from about 360 yen per dollar in 1971 to 180 yen in fall 1978. The yen exchange rate then rose (i.e., the yen depreciated) to 260 yen per dollar in fall 1982 and again in spring 1985, but then it declined almost continuously until only slightly above 80 yen per dollar in spring of 1995; it stayed in the range 109 to 125 yen per dollar between 1996 and 2007, and it averaged 82 yen per dollar in March 2012.

The second panel of Figure 14.3 shows that the euro depreciated sharply from \$1.17/€, the value at which it was introduced on January 1, 1999, to \$0.85/€ in October 2000, but then it appreciated just as sharply from the beginning of 2002 to reach the high of \$1.36/€ in December 2004. The euro then depreciated to an average of \$1.25/€ in 2005, it rose to the all-time peak of \$1.58/€ in July 2008, but then it depreciated to \$1.32/€ in March 2012. Note that the euro dollar exchange rate in Figure 14.3 is defined as the dollar price of the euro (rather than the other way around, as for the exchange rate of the other currencies shown in Figure 14.3). Note also the sharp depreciation of the British pound with respect to the U.S. dollar from 1980 to 1985 (and in 2008) and the sharp appreciation of the Canadian dollar with respect to the U.S. from 2002 to the beginning of 2008 (and depreciation in fall 2008, followed by appreciation).

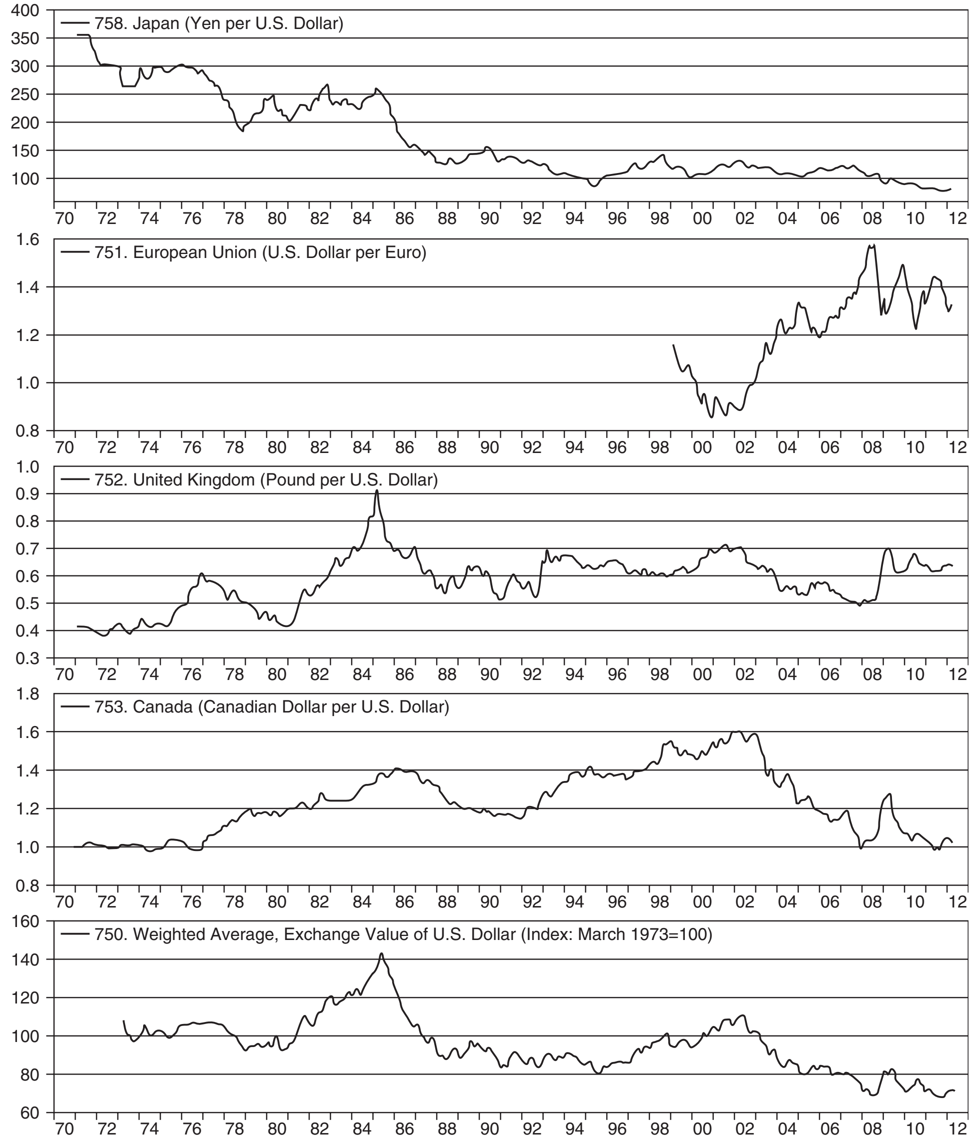


FIGURE 14.3. The Exchange Rate of Major Currencies and the Dollar Effective Exchange Rate, 1970–2012.

The top four panels of the figure show the fluctuations of the exchange rate of the Japanese yen, the euro, the British pound, and the Canadian dollar with respect to the dollar from 1970 to 2009 (the euro only from its creation at the beginning of 1999). The exchange rate used is the foreign-currency value of the dollar (so that an increase in the exchange rate refers to a depreciation of the foreign currency and appreciation of the dollar), except for the euro. The bottom panel shows the effective exchange rate of the dollar defined as the weighted average of the foreign-currency value of the dollar, with March 1973 = 100. The figure shows the wide fluctuations of exchange rates from 1970 to 2012.

Source: The Conference Board, *Business Cycle Indicators*, April 2012, p. 23.

The bottom panel of Figure 14.3 shows the effective exchange rate of the dollar (defined as the weighted average foreign-currency value of the dollar, with March 1973 = 100). The index is useful because the exchange rate between the U.S. dollar and the various currencies changed by different amounts and sometimes in different directions over time. The sharp depreciation of the other currencies and appreciation of the dollar from the beginning of 1980 until the beginning of 1985, as well as the appreciation of the other currencies and depreciation of the dollar from the beginning of 1985 until the end of 1987, are clearly shown in the figure. Although less spectacularly, the effective exchange rate of the dollar has also fluctuated a great deal since 1987, and it was 75 in March 2012 (see Figure 14.3).

The frequent and relatively large fluctuations in exchange rates shown in Figure 14.3 impose foreign exchange risks on all individuals, firms, and banks that have to make or receive future payments denominated in a foreign currency. For example, suppose a U.S. importer purchases €100,000 worth of goods from the European Monetary Union and has to pay in three months in euros. If the present spot rate of the pound is $SR = \$1/€1$, the current dollar value of the payment that he or she must make in three months is $100,000. However, in three months the spot rate might change to $SR = \$1.10/€1$. Then the importer would have to pay $110,000, or $10,000 more, for the imports. Of course, in three months the spot rate might be $SR = \$0.90/€1$, in which case the importer would have to pay only $90,000, or $10,000 less than anticipated. However, the importer has enough to worry about in the import business without also having to deal with this exchange risk. As a result, the importer will usually want to insure against an increase in the dollar price of the euro (i.e., an increase in the spot rate) in three months.

Similarly, a U.S. exporter who expects to receive a payment of €100,000 in three months will receive only $90,000 (instead of the $100,000 that he or she anticipates at today's spot rate of $SR = \$1/€1$) if the spot rate in three months is $SR = \$0.90/€1$. Once again, the spot rate could be higher in three months than it is today so that the exporter would receive more than anticipated. However, the exporter, like the importer, will usually want to avoid (at a small cost) the exchange risk that he or she faces. Another example is provided by an investor who buys euros at today's spot rate in order to invest in three-month EMU treasury bills paying a higher rate than U.S. treasury bills. However, in three months, when the investor wants to convert euros back into dollars, the spot rate may have fallen sufficiently to wipe out most of the extra interest earned on the EMU bills or even produce a loss.

These three examples clearly show that whenever a future payment must be made or received in a foreign currency, a foreign exchange risk, or a so-called open position, is involved because spot exchange rates vary over time. In general, businesspeople are risk averse and will want to avoid or insure themselves against their foreign exchange risk. (Note that arbitrage does not involve any exchange risk since the currency is bought at the cheaper price in one monetary center to *be resold immediately* at the higher price in another monetary center.) A foreign exchange risk arises not only from transactions involving future payments and receipts in a foreign currency (the *transaction exposure*), but also from the need to value inventories and assets held abroad in terms of the domestic currency for inclusion in the firm's consolidated balance sheet (the *translation* or *accounting exposure*), and in estimating the domestic currency value of the future profitability of the firm (the *economic exposure*). In what follows, we concentrate on the transaction exposure or risk.

14.5B Hedging

Hedging refers to the avoidance of a foreign exchange risk, or the covering of an open position. For example, the importer of the previous example could borrow €100,000 at the present spot rate of $SR = \$1/€1$ and leave this sum on deposit in a bank (to earn interest) for three months, when payment is due. By so doing, the importer avoids the risk that the spot rate in three months will be higher than today's spot rate and that he or she would have to pay more than $100,000 for the imports. The cost of insuring against the foreign exchange risk in this way is the positive difference between the interest rate the importer has to pay on the loan of €100,000 and the lower interest rate he or she earns on the deposit of €100,000. Similarly, the exporter could borrow €100,000 today, exchange this sum for $100,000 at today's spot rate of $SR = \$1/€1$, and deposit the $100,000 in a bank to earn interest. After three months, the exporter would repay the loan of €100,000 with the payment of €100,000 he or she receives. The cost of avoiding the foreign exchange risk in this manner is, once again, equal to the positive difference between the borrowing and deposit rates of interest.

Covering the foreign exchange risk in the spot market as indicated above has a very serious disadvantage, however. The businessperson or investor must borrow or tie up his or her own funds for three months. To avoid this, hedging usually takes place in the forward market, where no borrowing or tying up of funds is required. Thus, the importer could buy euros forward for delivery (and payment) in three months at today's three-month forward rate. If the euro is at a three-month forward premium of 4 percent per year, the importer will have to pay $101,000 in three months for the €100,000 needed to pay for the imports. Therefore, the hedging cost will be $1,000 (1 percent of $100,000 for the three months). Similarly, the exporter could sell pounds forward for delivery (and payment) in three months at today's three-month forward rate, in anticipation of receiving the payment of €100,000 for the exports. Since no transfer of funds takes place until three months have passed, the exporter need not borrow or tie up his or her own funds now. If the euro is at a three-month forward discount of 4 percent per year, the exporter will get only $99,000 for the €100,000 he or she delivers in three months. On the other hand, if the euro is at a 4 percent forward premium, the exporter will receive $101,000 in three months with certainty by hedging.

A foreign exchange risk can also be hedged and an open position avoided in the futures or options markets. For example, suppose that an importer knows that he or she must pay €100,000 in three months and the three-month forward rate of the pound is $FR = \$1/€1$. The importer could either purchase the €100,000 forward (in which case he or she will have to pay $100,000 in three months and receive the €100,000) or purchase an option to purchase €100,000 in three months, say at $1/€1, and pay now the premium of, say, 1 percent (or $1,000 on the $100,000 option). If in three months the spot rate of the pound is $SR = \$0.98/€1$, the importer would have to pay $100,000 with the forward contract, but could let the option expire unexercised and get the €100,000 at the cost of only $98,000 on the spot market. In that case, the $1,000 premium can be regarded as an insurance policy and the importer will save $2,000 over the forward contract.

In a world of foreign exchange uncertainty, the ability of traders and investors to hedge greatly facilitates the international flow of trade and investments. Without hedging there would be smaller international capital flows, less trade and specialization in production, and smaller benefits from trade. Note that a large firm, such as a multinational corporation, that has to make and receive a large number of payments in the same foreign currency at the same time in the future need only hedge its net open position. Similarly, a bank has an open position only in the amount of its net balance on contracted future payments and receipts in each foreign currency at each future date. The bank closes as much of its open positions as possible by dealing with other banks (through foreign exchange brokers), and it may cover the remainder in the spot, futures, or options markets.

14.5c Speculation

Speculation is the opposite of hedging. Whereas a hedger seeks to cover a foreign exchange risk, a speculator accepts and even seeks out a foreign exchange risk, or an open position, in the hope of making a profit. If the speculator correctly anticipates future changes in spot rates, he or she makes a profit; otherwise, he or she incurs a loss. As in the case of hedging, speculation can take place in the spot, forward, futures, or options markets—usually in the forward market. We begin by examining speculation in the spot market.

If a speculator believes that the spot rate of a particular foreign currency will rise, he or she can purchase the currency now and hold it on deposit in a bank for resale later. If the speculator is correct and the spot rate does indeed rise, he or she earns a profit on each unit of the foreign currency equal to the spread between the previous lower spot rate at which he or she purchased the foreign currency and the higher subsequent spot rate at which he or she resells it. If the speculator is wrong and the spot rate falls instead, he or she incurs a loss because the foreign currency must be resold at a price lower than the purchase price.

If, on the other hand, the speculator believes that the spot rate will fall, he or she borrows the foreign currency for three months, immediately exchanges it for the domestic currency at the prevailing spot rate, and deposits the domestic currency in a bank to earn interest. After three months, if the spot rate on the foreign currency is lower, as anticipated, the speculator earns a profit by purchasing the currency (to repay the foreign exchange loan) at the lower spot rate. (Of course, for the speculator to earn a profit, the new spot rate must be sufficiently lower than the previous spot rate to also overcome the possibly higher interest rate paid on a foreign currency deposit over the domestic currency deposit.) If the spot rate in three months is higher rather than lower, the speculator incurs a loss.

In both of the preceding examples, the speculator operated in the spot market and either had to tie up his or her own funds or had to borrow to speculate. It is to avoid this serious shortcoming that speculation, like hedging, usually takes place in the forward market. For example, if the speculator believes that the spot rate of a certain foreign currency will be higher in three months than its present three-month forward rate, the speculator purchases a specified amount of the foreign currency forward for delivery (and payment) in three months. After three months, if the speculator is correct, he or she receives delivery of the foreign currency at the lower agreed forward rate and immediately resells it at the higher spot rate, thus realizing a profit. Of course, if the speculator is wrong and the spot rate in three months is lower than the agreed forward rate, he or she incurs a loss. In any event, no currency changes hands until the three months are over (except for the normal 10 percent security margin that the speculator is required to pay at the time he or she signs the forward contract).

As another example, suppose that the three-month forward rate on the euro is $FR =$ \$1.01/€1 and the speculator believes that the spot rate of the euro in three months will be

$SR = \$0.99/€1$. The speculator then sells euros forward for delivery in three months. After three months, if the speculator is correct and the spot rate is indeed as anticipated, he or she purchases euros in the spot market at $SR = \$0.99/€1$ and immediately resells them to fulfill the forward contract at the agreed forward rate of \$1.01/€1, thereby earning a profit of 2 cents per euro. If the spot rate in three months is instead $SR = \$1.00/€1$, the speculator earns only 1 cent per euro. If the spot rate in three months is \$1.01/€1, the speculator earns nothing. Finally, if the spot rate in three months is higher than the forward rate at which the speculator sold the forward euros, the speculator incurs a loss on each euro equal to the difference between the two rates.

As an alternative, the speculator (who believes that the euro will depreciate) could have purchased an option to sell a specific amount of euros in three months at the rate of, say, \$1.01/€1. If the speculator is correct and the spot rate of the euro in three months is indeed \$0.99/€1 as anticipated, he or she will exercise the option, buy euros in the spot market at \$0.99/€1, and receive \$1.01/€1 by exercising the option. By so doing, the speculator earns 2 cents per euro (from which he or she deducts the premium or the option price to determine the net gain). In this case, the result will be the same as with the forward contract, except that the option price may exceed the commission on the forward contract so that his or her net profit with the option may be a little less. On the other hand, if the speculator is wrong and the spot rate of the euro is much higher than expected after three months, he or she will let the option contract expire unexercised and incur only the cost of the premium or option price. With the forward contract, the speculator would have to honor his or her commitment and incur a much larger loss.

When a speculator buys a foreign currency on the spot, forward, or futures market, or buys an option to purchase a foreign currency in the expectation of reselling it at a higher future spot rate, he or she is said to take a *long position* in the currency. On the other hand, when the speculator borrows or sells forward a foreign currency in the expectation of buying it at a future lower price to repay the foreign exchange loan or honor the forward sale contract or option, the speculator is said to take a *short position* (i.e., the speculator is now selling what he or she does not have).

Speculation can be stabilizing or destabilizing. Stabilizing speculation refers to the *purchase* of a foreign currency when the domestic price of the foreign currency (i.e., the exchange rate) falls or is low, in the expectation that it will soon rise, thus leading to a profit. Or it refers to the sale of the foreign currency when the exchange rate rises or is high, in the expectation that it will soon fall. Stabilizing speculation moderates fluctuations in exchange rates over time and performs a useful function.

On the other hand, destabilizing speculation refers to the *sale* of a foreign currency when the exchange rate falls or is low, in the expectation that it will fall even lower in the future, or the purchase of a foreign currency when the exchange rate is rising or is high, in the expectation that it will rise even higher in the future. Destabilizing speculation thus magnifies exchange rate fluctuations over time and can prove very disruptive to the international flow of trade and investments. Whether speculation is primarily stabilizing or destabilizing is a very important question, to which we return in Chapter 16, when we analyze in depth the operation of a flexible exchange rate system, and in Chapter 20, when we compare the operation of a flexible exchange rate system with that of a fixed exchange rate system. In general, it is believed that under "normal" conditions speculation is stabilizing, and we assume so here.

Speculators are usually wealthy individuals or firms rather than banks. However, anyone who has to make a payment in a foreign currency in the future can speculate by speeding up payment if he or she expects the exchange rate to rise and delaying it if he or she expects the exchange rate to fall, while anyone who has to receive a future payment in a foreign currency can speculate by using the reverse tactics. For example, if an importer expects the exchange rate to rise soon, he or she can anticipate the placing of an order and pay for imports right away. On the other hand, an exporter who expects the exchange rate to rise will want to delay deliveries and extend longer credit terms to delay payment. These are known as *leads* and *lags* and are a form of speculation.

In recent years, a number of huge losses have been incurred by speculating on the movement of exchange rates. One of the most spectacular was the case of Showaka Shell Sekiyu, a Japanese oil refiner and distributor 50 percent owned by Royal Dutch Shell. From 1989 until 1992, the finance department of Showaka bet $6.44 billion worth in the futures market that the dollar would appreciate. When the dollar depreciated (and the yen appreciated—see Figure 14.3) instead, Showaka lost $1.37 billion. More recently, there was the five-year $750 million cumulative foreign exchange loss by John Rusnak of Allfirst Bank, the U.S. subsidiary of Allied Irish Banks, Ireland's largest bank, on trading the U.S. dollar against the Japanese yen discovered in February 2002. And in January 2004, four foreign currency dealers at the National Australia Bank incurred losses of $360 million in three months of unauthorized foreign exchange trades. Yes, speculation in foreign exchange is very risky and can lead to huge losses.

14.6 Interest Arbitrage and the Efficiency of Foreign Exchange Markets

Interest arbitrage refers to the international flow of short-term liquid capital to earn higher returns abroad. Interest arbitrage can be covered or uncovered. These are discussed in turn. We will then examine the covered interest parity theory and the efficiency of foreign exchange markets.

14.6A Uncovered Interest Arbitrage

Since the transfer of funds abroad to take advantage of higher interest rates in foreign monetary centers involves the conversion of the domestic to the foreign currency to make the investment, and the subsequent reconversion of the funds (plus the interest earned) from the foreign currency to the domestic currency at the time of maturity, a foreign exchange risk is involved due to the possible depreciation of the foreign currency during the period of the investment. If such a foreign exchange risk is covered, we have covered interest arbitrage; otherwise, we have uncovered interest arbitrage. Even though interest arbitrage is usually covered, we begin by examining the simpler uncovered interest arbitrage.

Suppose that the interest rate on three-month treasury bills is 6 percent at an annual basis in New York and 8 percent in Frankfurt. It may then pay for a U.S. investor to exchange dollars for euros at the current spot rate and purchase EMU treasury bills to earn the extra 2 percent interest at an annual basis. When the EMU treasury bills mature, the U.S. investor may want to exchange the euros invested plus the interest earned back into dollars. However, by that time, the euro may have depreciated so that the investor would get back fewer dollars per euro than he or she paid. If the euro depreciates by 1 percent at an annual basis during the three months of the investment, the U.S. investor nets only about 1 percent from this foreign investment (the extra 2 percent interest earned minus the 1 percent lost from the depreciation of the euro) at an annual basis (1/4 of 1 percent for the three months or quarter of the investment). If the euro depreciates by 2 percent at an annual basis during the three months, the U.S. investor gains nothing, and if the euro depreciates by more than 2 percent, the U.S. investor loses. Of course, if the euro *appreciates*, the U.S. investor gains both from the extra interest earned and from the appreciation of the euro.

Related to uncovered interest arbitrage is carry trade. Carry trade refers to the strategy in which an investor borrows low-yielding currencies and lends (invest in) high-yielding currencies. That is, an investor borrows a currency with a relatively low interest rate and uses the funds to purchase another currency yielding a higher interest rate. If the higher-yielding currency depreciates during the period of the investment, however, the investor runs the risk of losing money (see Case Study 14-5).

CASE STUDY 14-5 Carry Trade

Earlier defined, carry trade is the strategy in which an investor borrows a low-yielding currency and lends (invests in) a higher-yielding currency. The risk is that if during the investment period the higher-yielding currency depreciates vis-à-vis the lower-yielding currency by a higher percentage than the positive interest differentials, the investor would lose money.

For example, suppose that in a "yen carry trade" the investor borrows yens from a Japanese bank at 1 percent interest, exchanges the yens for U.S. dollars at the prevailing dollar/yen exchange rate, and then buys a U.S. bond paying, say, 4 percent interest. The investor would earn 3 percent net on her or his investment—so long as the dollar/yen exchange rate does not change during the period of the investment. If the dollar appreciated with respect to the yen, the investor would earn that much more. If, on the other hand, the dollar depreciated with respect to the yen during the investment period, the investor would earn less, break even, or incur a loss. Specifically, if the dollar depreciated by less than 3 percent with respect to the yen during the investment period, the investor would earn that much less. If the dollar depreciated by exactly 3 percent, the investor would break even (assuming no transaction costs). If, on the other hand, the dollar depreciated by more than 3 percent, the investor's loss would equal the difference between the rate of the dollar depreciation and the positive interest differential in favor of the dollar. Thus, the big risk in carry trade is the uncertainty of exchange rates.

Actually, the gains or losses from carry trade will be much greater than indicated above because of leveraging (i.e., because the investor buys the U.S. bond on margin—puts down only a small fraction, usually 10 percent, of the bond price). In this case, the gains or losses would be amplified tenfold.

In theory, according to *uncovered interest rate parity,* carry trades should not yield a predictable profit because the difference in interest rates between two currencies should equal the rate at which investors expect the low-interest-rate currency to appreciate with respect to the high-interest-rate one. Carry trades, however, tend to weaken the currency that is borrowed, because investors sell the borrowed money by converting it to other currencies. In fact, the carry trade is often blamed for rapid depreciation of the low-yielding currency and appreciation of the higher-yielding currency, thus increasing exchange rate volatility.

(continued)

■ CASE STUDY 14-5 Continued

The U.S. dollar and the yen have been the currencies most heavily used in carry trade transactions since the 1990s, with the yen being the low-rate currency and U.S. dollar bonds being the higher-yielding asset. At its peak, in early 2007, the yen carry trade was estimated to be about $1 trillion. That trade largely collapsed in 2008 as a result of the rapid appreciation of the yen. This created pressure to cover debts denominated in yen by converting foreign assets into yen—which led to further yen appreciation. Exchange rate volatility often leads to carry trade unwinds, the largest of which was the 2008 one, and that contributed substantially to the credit crunch that caused the 2008 global financial crisis.

Source: C. Burnside, M. Eichenbaum, and S. Rebelo, "Carry Trade and Momentum in Currency Markets," *Annual Review of Financial Economics*, December 2011, pp. 511–535.

14.6B Covered Interest Arbitrage

Investors of short-term funds abroad generally want to avoid the foreign exchange risk; therefore, interest arbitrage is usually covered. To do this, the investor exchanges the domestic for the foreign currency at the current spot rate in order to purchase the foreign treasury bills, and at the same time the investor sells forward the amount of the foreign currency he or she is investing plus the interest he or she will earn so as to coincide with the maturity of the foreign investment. Thus, covered interest arbitrage refers to the spot purchase of the foreign currency to make the investment and the offsetting simultaneous forward sale *(swap)* of the foreign currency to cover the foreign exchange risk. When the treasury bills mature, the investor can then get the domestic currency equivalent of the foreign investment plus the interest earned without a foreign exchange risk. Since the currency with the higher interest rate is usually at a forward discount, the net return on the investment is *roughly* equal to the interest differential in favor of the foreign monetary center minus the forward discount on the foreign currency. This reduction in earnings can be viewed as the cost of insurance against the foreign exchange risk.

As an illustration, let us continue the previous example where the interest rate on three-month treasury bills is 6 percent per year in New York and 8 percent in Frankfurt, and assume that the euro is at a forward discount of 1 percent per year. To engage in covered interest arbitrage, the U.S. investor exchanges dollars for euros at the current exchange rate (to purchase the EMU treasury bills) and at the same time sells forward a quantity of euros equal to the amount invested plus the interest he or she will earn at the prevailing forward rate. Since the euro is at a forward discount of 1 percent per year, the U.S. investor loses 1 percent on an annual basis on the foreign exchange transaction to cover the foreign exchange risk. The net gain is thus the extra 2 percent interest earned minus the 1 percent lost on the foreign exchange transaction, or 1 percent on an annual basis ($\frac{1}{4}$ of 1 percent for the three months or quarter of the investment). Note that we express both the interest differential and the forward discount at an annual basis and then divide by four to get the net gain for the three months or quarter of the investment.

However, as covered interest arbitrage continues, the possibility of gains diminishes until it is completely wiped out. This occurs for two reasons. First, as funds are transferred from New York to Frankfurt, the interest rate rises in New York (since the supply of funds in New

York diminishes) and falls in Frankfurt (since the supply of funds in Frankfurt increases). As a result, the interest differential in favor of Frankfurt diminishes. Second, the purchase of euros in the spot market increases the spot rate, and the sale of euros in the forward market reduces the forward rate. Thus, the forward discount on the euro (i.e., the difference between the spot rate and the forward rate) rises. With the interest differential in favor of Frankfurt diminishing and the forward discount on the euro rising, the net gain falls for both reasons until it becomes zero. Then the euro is said to be at covered interest arbitrage parity (CIAP). Here, the interest differential in favor of the foreign monetary center is equal to the forward discount on the foreign currency (both expressed on an annual basis). In the real world, a net gain of at least ¼ of 1 percent per year is normally required to induce funds to move internationally under covered interest arbitrage. Thus, in the preceding example, the net annualized gain would be ¾ of 1 percent after considering transaction costs or 0.1875 percent for three months.

If the euro is instead at a forward premium, the net gain to the U.S. investor will equal the extra interest earned plus the forward premium on the euro. However, as covered interest arbitrage continues, the interest differential in favor of Frankfurt diminishes (as indicated earlier) and so does the forward premium on the euro until it becomes a forward discount and all of the gains are once again wiped out. Thus, the spot rate and the forward rate on a currency are closely related through covered interest arbitrage.

14.6C Covered Interest Arbitrage Parity

Figure 14.4 illustrates in a more general and rigorous way the relationship, through covered interest arbitrage, between the interest rate differentials between two nations and the forward discount or premium on the foreign currency. The vertical axis of the figure measures the interest rate in the nation's monetary center *(i)* minus the interest rate in foreign monetary center (i^*), or ($i-i^*$), in percentages per year. Negative values for ($i-i^*$) indicate that the interest rate is higher abroad than in the nation, while positive values indicate that the interest rate is higher in the nation than abroad. The horizontal axis measures the forward discount (–) or premium (+) on the foreign currency also expressed in percentages per year.

The solid diagonal line indicates all points of *covered interest arbitrage parity (CIAP)*. Thus, when ($i-i^*$) equals -1, the foreign currency is at a forward discount of 1 percent per year. A positive interest differential of 1 is associated with a forward *premium* of 1 percent. When the interest differential is zero, the foreign currency is neither at a forward discount nor at a forward premium (i.e., the forward rate on the foreign currency is equal to its spot rate), and we are on the *CIAP line* at the origin.

Below the CIAP line, either the negative interest differential (in favor of the foreign monetary center) exceeds the forward discount on the foreign currency or the forward premium exceeds the positive interest differential (see the figure). In either case, there will be a net gain from a covered interest arbitrage (CIA) *outflow*. For example, at point A, the negative interest differential is 2 percentage points per year in favor of the foreign monetary center, while the foreign currency is at a forward discount of 1 percent per year. Thus, there is a covered interest arbitrage margin of 1 percent per year in favor of the foreign nation, leading to a capital outflow. Similarly, point A' involves a forward premium of 2 percent on the foreign currency and a positive interest differential of only 1 percent in favor of the domestic monetary center. Thus, investors have an incentive to invest abroad because they would gain 2 percent on the exchange transaction and lose only 1 percent in interest in

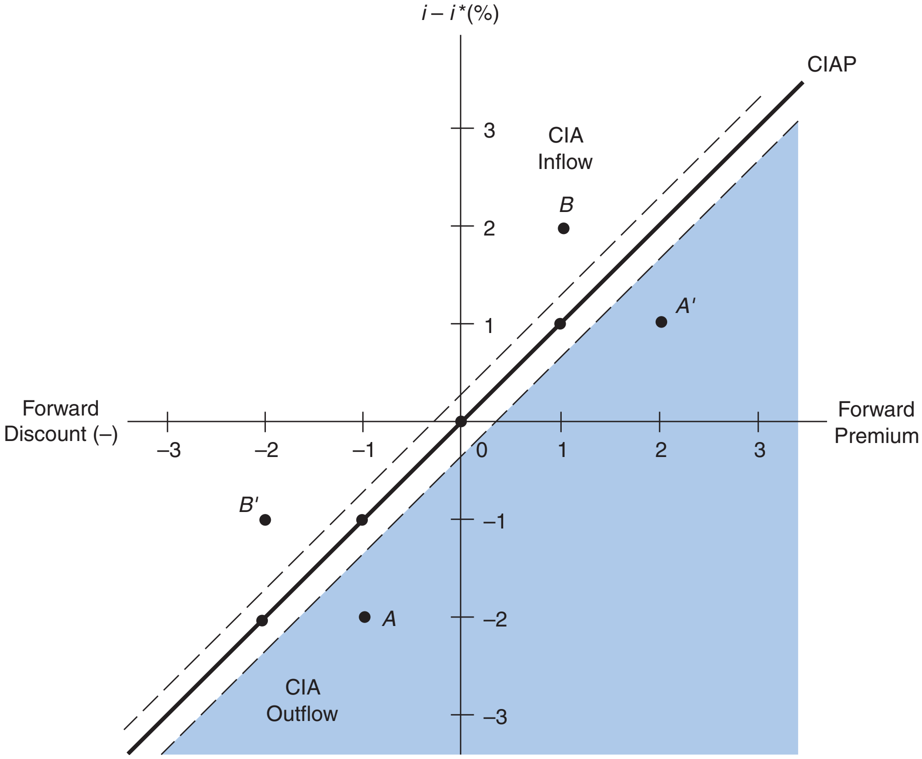


FIGURE 14.4. Covered Interest Arbitrage.
The vertical axis measures the difference in the interest rate in the home nation *(i)* and in the foreign nation (i^*) in percentages per annum. The horizontal axis measures the forward exchange rate, with the minus sign indicating a forward discount and positive values indicating a forward premium on the foreign currency in percent per annum. The solid diagonal line is the covered interest parity (CIAP) line. Below the CIAP line, either the negative interest differential exceeds the forward discount or the forward premium exceeds the positive interest differential. In either case, there will be a capital outflow under covered interest arbitrage. Above the CIAP line, the opposite is true and there will be an arbitrage inflow.

investing abroad. The net gain would then be 1 percent per year or ¼ of 1 percent for the three months or quarter of the investment.

As the arbitrage outflow continues, the net gain diminishes and tends to disappear. Specifically, starting from point *A*, the transfer of funds abroad reduces the interest differential in favor of the foreign monetary center (say, from −2 to −1.5) and increases the forward discount on the foreign currency (say, from −1 to −1.5), as explained in the previous section, so as to reach the CIAP line (see the figure). Starting from point *A*′, the transfer of funds abroad will increase the positive interest differential (say, from 1 to 1.5) and reduce the forward premium (say, from +2 to +1.5) so as to once again reach the CIAP line. Specifically, as funds move abroad, interest rates tend to rise at home and decline abroad. Since interest rates were already higher at home, the positive interest differential increases. On the other hand, as investors purchase the foreign currency to invest abroad, the spot rate rises. As they sell the foreign currency forward to cover their foreign exchange risk, the forward rate declines. Thus, the forward premium (i.e., the excess of the forward rate over the spot rate) diminishes. With the positive interest differential increasing and the forward premium decreasing, the net gain from arbitrage outflow diminishes until it becomes zero when the CIAP line is reached and the arbitrage outflow comes to an end.

Above the interest parity line, either the positive interest differential exceeds the forward premium on the foreign currency (point B in the figure) or the negative interest differential is smaller than the forward discount on the foreign currency (point B'). In either case, it pays for foreigners to invest in our country, and there will be an arbitrage *inflow*. However, as the arbitrage inflow continues, the net gain diminishes and then disappears when the CIAP line is reached. In reality, interest arbitrage (inflow and outflow) will come to an end when the net gain reaches about ¼ of 1 percent per year (1/16 of 1 percent for three months). This range is shown by the white area between the diagonal *dashed* lines in the figure.

14.6D Covered Interest Arbitrage Margin

We have seen that points on the CIAP line indicate either that the negative interest differential (in favor of the foreign monetary center) equals the forward discount *(FD)* on the foreign currency or that the positive interest differential (in favor of the home monetary center) equals the forward premium *(FP)* on the foreign currency. This can be expressed as:

$$i - i^* = FD \text{ if } i < i^* \text{ or}$$
$$i - i^* = FP \text{ if } i > i^*$$

But since the forward rate minus the spot rate divided by the spot rate [i.e., $(FR - SR)/SR$] measures the forward discount (if $SR > FR$) or the forward premium (if $FR > SR$), the foregoing condition for CIAP can be rewritten as

$$i - i^* = (FR - SR)/SR \qquad (14\text{-}1)$$

We can now define the covered interest arbitrage margin (CIAM) or the percentage gain from covered interest arbitrage as

$$\text{CIAM} = (i - i^*) - FD \text{ or } FP$$

or more precisely as

$$\text{CIAM} = (i - i^*)/(1 + i^*) - (FR - SR)/SR \qquad (14\text{-}2)$$

where $(1 + i^*)$ is a weighting factor. This formula is derived in the appendix to this chapter.

To see how the formula works, let us apply it to the case where the interest rate on a three-month treasury bill is 6 percent on an annual basis in New York and 8 percent in Frankfurt, while the spot rate of the euro is \$1/€1 and the three-month forward rate on the euro is \$0.99/€1 on an annual basis. Applying the CIAM formula, we get:

$$\begin{aligned}\text{CIAM} &= (0.06 - 0.08)/(1 + 0.08) - (\$0.99 - \$1.00)/\$1.00 \\ &= (-0.02)/1.08 - (-\$0.01)/\$1.00 \\ &= -0.01852 + 0.01 \\ &= -0.00852\end{aligned}$$

The negative sign for the CIAM refers to a CIA outflow or investing in Frankfurt. The absolute value of the CIAM indicates that the extra return per dollar invested in Frankfurt is 0.852 percent per year or 0.213 per quarter. (These values are similar to the approximate values obtained in the previous subsection without the weighting factor.) On a $10 million investment, this means an extra return of $21,300 for investing in three-month EMU treasury bills with the foreign exchange risk covered for three months. From this extra return, we would have to deduct the transaction costs. If these are ¼ of 1 percent per year or 1/16 of 1 percent per quarter, we get transaction costs of (0.01/16) times $10 million, which are $6,250. Thus, the net gain from investing $10 million in Frankfurt under CIA with the transaction costs taken into consideration is $21,300 minus $6,250, or $15,050 for the three months of the investment.

In the real world, significant covered interest arbitrage margins are sometimes observed. The reason is not that covered interest arbitrage does not work, but it may be the result of other forces at work. For example, higher tax rates abroad may exceed the CIAM in favor of the foreign monetary center so that no arbitrage outflows take place. Similarly, investors may not take advantage of a CIAM in favor of the foreign monetary center if they fear that the foreign government might default or impose exchange restrictions on the repatriation of profits and principal on the foreign investment. Or simply, large and persistent CIAM may exist because of lack of information on foreign investment opportunities in developing countries' financial markets.

14.6E Efficiency of Foreign Exchange Markets

A market is said to be *efficient* if prices reflect all available information. The foreign exchange market is said to be efficient if forward rates accurately predict future spot rates; that is, if forward rates reflect all available information and quickly adjust to any new information so that investors cannot earn consistent and unusual profits by utilizing any available information.

Questions of market efficiency are important because only when markets are efficient do prices correctly reflect the scarcity value of the various resources and result in allocational efficiency. For example, if, for whatever reason, the price of a commodity is higher than its value to consumers, then too many resources flow to the production of the commodity at the expense of other commodities that consumers prefer.

By their very nature, tests of market efficiency are very difficult to formulate and to interpret. Even if foreign exchange markets were efficient, we cannot expect the forward rate of a currency to be identical to the future spot rate of the currency because the latter also depends on unforeseen events. However, if the forward rate exceeds the future spot rate as often as it falls below it, then we could say that the market is efficient in the sense that there is no available information that investors could systematically use to ensure consistent and unusual profits.

Many empirical tests have been conducted on the efficiency of foreign exchange markets by *Levich* (1985) and others (see the references in the Selected Bibliography). Most of these studies seem to indicate that foreign exchange markets are efficient according to this definition of efficiency. For example, several empirical tests show that few opportunities exist for risk-free arbitrage, and deviations from interest rate parity are, for the most part, smaller than transaction costs. Similarly, speculators sometimes earn profits and sometimes incur losses and seldom face opportunities for certain and large profits. *Frankel and MacArthur* (1988) have presented evidence that covered interest arbitrage holds reasonably well for large industrial countries but not for small ones, and *Lewis* (1995) shows that the theory does not hold well for developing countries. *Clarida et al.* (2003) suggest that forward-exchange-rate time series contain valuable information not yet fully utilized for predicting the future path of the spot exchange rates.

Thus, while many studies seem to indicate that foreign exchange markets are fairly efficient, others do not. Exchange rates seem to respond very quickly to news, are very volatile, have defied all attempts at being accurately forecasted, and the variance in their fluctuation has been relatively large, so that even if the forward rate were an unbiased predictor of the future spot rate it would not be an efficient one. We return to this topic in our discussion of foreign exchange forecasting in the next chapter.

As exchange rates have become more volatile, the volume of foreign exchange transactions has grown much faster than the volume of world trade and faster than even the much larger flows of investment capital. Only over the 1998–2001 period has the volume of foreign exchange transactions declined (from $1.5 trillion in 1998 to $1.2 trillion in 2001). This was due to the introduction of the euro (which replaced several important currencies, thus eliminating the need to convert these currencies into one another) and the consolidation of the banking sector (which eliminated a great deal of the interbank foreign exchange market). More recently, the volume of foreign exchange transactions has resumed its growth and reached $4.0 billion in 2012.

14.7 Eurocurrency or Offshore Financial Markets

In this section, we examine the operation and effects of Eurocurrency or offshore financial markets and also discuss Eurobonds and Euronotes.

14.7A Description and Size of the Eurocurrency Market

Eurocurrency refers to commercial bank deposits outside the country of their issue. For example, a deposit denominated in U.S. dollars in a British commercial bank (or even in a British branch of a U.S. bank) is called a Eurodollar. Similarly, a pound sterling deposit in a French commercial bank or in a French branch of a British bank is a Eurosterling, a deposit in euros (the new European currency) in a Swiss bank is simply a Eurodeposit (to avoid the awkward "Euroeuro"), and so on. These balances are usually borrowed or loaned by major international banks, international corporations, and governments when they need to acquire or invest additional funds. The market in which this borrowing and lending takes place is called the Eurocurrency market.

Initially, only the dollar was used in this fashion, and the market was therefore called the Eurodollar market. Subsequently, the other leading currencies (the German mark, the Japanese yen, the British pound sterling, the French franc, and the Swiss franc) began also to be used in this way, and so the market is now called the *Eurocurrency market*. The practice of keeping bank deposits denominated in a currency other than that of the nation in which the deposit is held has also spread to such non-European international monetary centers as Tokyo, Hong Kong, Singapore, and Kuwait, as well as to the Bahamas and the Cayman Islands in the Caribbean, and are appropriately called offshore deposits. Often, however, the name Eurodeposits is also used for such deposits outside Europe. With these geographical extensions, the Eurocurrency market has become an essentially 24-hour-a-day operation. Indeed, any foreign deposit made in a nation's bank (even if in the nation's currency) is Eurocurrency if the deposit is exempted from the regulations that the nation imposes on domestic deposits.

The Eurocurrency market consists mostly of short-term funds with maturity of less than six months. In measuring the size of the Eurocurrency market, we must distinguish between its gross and net size. The first includes interbank deposits. These are the deposits of banks with surplus Eurocurrencies to other banks facing an excess demand for Eurocurrency loans. Thus, interbank deposits represent transfers of Eurocurrency funds from one bank to another and do not involve a net increase in the total amount of Eurocurrency available to be lent to nonbank customers. Since the interbank market is a very important and active part of the Eurocurrency market, however, the gross measure seems more appropriate in measuring the size of the market (see Case Study 14-6).

14.7B Reasons for the Development and Growth of the Eurocurrency Market

There are several reasons for the existence and spectacular growth of the Eurocurrency market during the past four decades. One reason was the higher interest rates often prevailing abroad on short-term deposits. Until it was abolished in March 1986, Federal Reserve System *Regulation Q* put a ceiling on the interest rates that U.S. member banks could pay on deposits to levels that were often below the rates paid by European banks. As a result, short-term dollar deposits were attracted to European banks and became Eurodollars. Another important reason is that international corporations often found it very convenient to hold balances abroad for short periods in the currency in which they needed to make payments. Since the dollar is the most important international and vehicle currency in making and receiving international payments, it is only natural for a large proportion of the currency to be in Eurodollars. Still another reason is that international corporations can overcome domestic credit restrictions by borrowing in the Eurocurrency market.

The Eurocurrency market originated from the desire of communist nations to keep their dollar deposits outside the United States during the early days of the Cold War for fear that they might be frozen in a political crisis. After 1973, the impetus to the growth of the Eurodollar market came from the huge dollar deposits from petroleum-exporting countries arising from the manyfold increases in the price of petroleum. These nations also did not want to keep their dollar deposits in the United States for fear that the U.S. government might freeze them in a political crisis. Indeed, this is exactly what happened to the (small proportion of the) dollar deposits that Iran and Iraq did keep in the United States during the U.S. conflict with these nations in the late 1970s and early 1990s, respectively.

European banks are willing to accept deposits denominated in foreign currencies and are able to pay higher interest rates on these deposits than U.S. banks because they can lend these deposits at still higher rates. In general, the spread between lending and borrowing rates on Eurocurrency deposits is smaller than that of U.S. banks. Thus, European banks are often able to pay higher deposit rates and lend at lower rates than U.S. banks. This is the result of (1) the fierce competition for deposits and loans in the Eurocurrency market, (2) the lower

CASE STUDY 14-6 Size and Growth of Eurocurrency Market

Table 14.4 shows the gross and the net size of Eurocurrency deposits (i.e., international bank deposits denominated in currencies other than the currency of the borrower's or lender's nation) from 1964 to 2011, as well as the percentage of the gross market held in the form of Eurodollars. For comparison purposes, the table also gives the U.S. money supply (broadly defined, or M2) over the same period of time. The table also shows that the gross Eurocurrency market grew extremely rapidly from \$19 billion in 1964 to \$17.9 trillion in 2007, but then it declined to \$15.8 trillion as a result of the global financial crisis, and it was \$16.9 trillion in 2011. Gross Eurocurrency deposits thus went from less than 5 percent of the M2 measure of the U.S. money supply in 1964 to 238 percent in 2007, and they were 174 percent in 2011. While the U.S. money supply grew 23 times from 1964 to 2011, gross Eurocurrency deposits grew 890 times! The table also shows that the percentage of Eurodollars in gross Eurocurrency deposits declined from 79 percent in 1968 to 55 percent in 1996 and 2007, and it was 58 percent in 2011.

TABLE 14.4. Size of Eurocurrency Deposit Market (in billions of dollars)

Year	Gross Size	Net Size	Eurodollars as a Percentage of Gross	U.S. Money Stock (M2)
1964	\$19	\$14	n.a.	\$425
1968	46	34	79	567
1972	210	110	78	802
1976	422	199	69	1, 152
1980	839	408	71	1, 599
1984	1, 343	667	78	2, 310
1988	2, 684	1, 083	64	2, 994
1992	3, 806	1, 751	59	3, 431
1996	4, 985	2, 639	55	3, 842
1998	6, 332	3, 122	53	4, 403
2000	6, 077	3, 532	63	4, 949
2002	7, 505	4, 590	61	5, 807
2004	10, 035	6, 952	57	6, 437
2006	14, 168	9, 604	59	7, 094
2007	17, 931	11, 966	55	7, 522
2008	16, 668	10, 928	58	8, 269
2009	15, 817	10, 829	57	8, 552
2010	16, 014	10, 983	58	8, 849
2011	16, 911	11, 374	58	9, 713

Sources: Morgan Guaranty, *World Financial Markets*; BIS, *Quarterly Survey*; and IMF, *International Financial Statistics*; various issues.

operating costs in the Eurocurrency market due to the absence of legal reserve requirements and other restrictions on Eurocurrency deposits (except for U.S. branches of European banks), (3) economies of scale in dealing with very large deposits and loans, and (4) risk diversification. Arbitrage is so extensive in the Eurocurrency market that interest parity is generally maintained.

14.7c Operation and Effects of the Eurocurrency Market

One important question is whether or not Eurocurrencies are money. Since Eurocurrencies are, for the most part, time rather than demand deposits, they are money *substitutes* or *near* money rather than money itself, according to the usual narrow definition of money or M1 (which includes only currency in circulation and demand deposits). Thus, Eurobanks do not, in general, create money, but they are essentially financial intermediaries bringing together lenders and borrowers, and operating more like domestic savings and loan associations (before they established the so-called NOW accounts) than like commercial banks in the United States. Perhaps more significant is that the rapid growth of Eurocurrency deposits since the 1960s has greatly increased world liquidity. They also led to a significant integration of domestic and international financial markets, which greatly increased competition and the efficiency of domestic banking in industrialized nations.

The existence, size, and rapid growth of the Eurocurrency market have created certain problems. One of the most serious is that the Eurocurrency market reduces the effectiveness of domestic stabilization efforts of national governments. For example, large firms that cannot borrow domestically because of credit restrictions often can and do borrow in the Eurocurrency market, thus frustrating the government effort to restrict credit to fight domestic inflationary pressures. This is particularly true for smaller nations where the volume of domestic financial transactions is small in relation to Eurocurrency transactions. A closely related problem is that frequent and large flows of liquid Eurocurrency funds from one international monetary center to another can produce great instability in foreign exchange rates and domestic interest rates.

Another possible problem is that Eurocurrency markets are largely uncontrolled. As a result, a deep worldwide recession could render some of the system's banks insolvent and possibly lead internationally to the type of bank panics that afflicted capitalist nations during the nineteenth century, the first third of the twentieth century, and the latter part of the last decade. Domestic bank panics were more or less eliminated by the creation of national central banks to regulate domestic banking through deposit insurance and by setting themselves up as "lenders of last resort" for domestic banks in a liquidity squeeze. In the Eurocurrency market, however, any attempt on the part of any one nation to regulate it would simply result in the market shifting its activity elsewhere. Thus, in order for regulations and guidelines to be effective, they need to be multilateral. Given the strong competition for Eurobanking business, however, it is unlikely that such multilateral cooperation will be forthcoming in the near future. Indeed, nations seem to go out of their way to provide the necessary infrastructures and eliminate existing restrictions in order to attract business.

A specific example of this is provided by the United States. Since December 1981, international banking facilities (IBFs) have been permitted in the United States. That is, U.S. banks were allowed to accept deposits from abroad and re-invest them overseas, and thus compete directly in the huge Eurodollar market. The new rules exempted foreign deposits in U.S. banks (even if in dollars) from federally imposed reserve and insurance requirements; as such, they are Eurodollars. Several states have also passed complementary legislation exempting profits on international banking transactions from state and local taxes. Almost 200 U.S. banks have entered this market, about half of them in New York, with the rest in Chicago, Miami, New Orleans, and San Francisco. The United States has captured about 20 percent of the huge Eurodollar market, and this has led to the creation of thousands of new jobs in banking, half of them in New York City.

14.7D Eurobond and Euronote Markets

Eurobonds are long-term debt securities that are sold outside the borrower's country to raise long-term capital in a currency other than the currency of the nation where the bonds are sold. An example is provided by a U.S. corporation selling bonds in London denominated in euros or U.S. dollars. Eurobonds have to be distinguished from *foreign bonds*, which refer simply to bonds sold in a foreign country but denominated in the currency of the country in which the bonds are being sold. An example is a U.S. multinational corporation selling bonds in England denominated in pounds sterling. Eurobonds, on the other hand, are bonds sold in a foreign country and denominated in another currency. The leading centers in the international bond market are London, Frankfurt, New York, and Tokyo. Eurobonds differ from most domestic bonds in that the former, as opposed to the latter, are usually unsecured (i.e., they do not require a collateral). Another type of debt security is Euronotes. These are medium-term financial instruments falling somewhat between short-term Eurocurrency bank loans and long-term international bonds. Corporations, banks, and countries make use of international notes to borrow medium-term funds in a currency other than the currency of the nation in which the notes are sold.

In 2010, corporations, banks, and countries raised $1,499 billion in Eurobonds and Euronotes—down from $2,784 billion in 2007 (because of the financial crisis), but up from $200 billion in 1993. The sharp increase from 1993 to 2007 was made possible by the opening up of capital markets in these international debt securities by several countries, including France, Germany, and Japan, and by the elimination of the U.S. interest-equalization tax. The incentive to issue Eurobonds and Euronotes is that they generally represent a lower cost of borrowing long-term funds than available alternatives. In 2010, about 72 percent of Eurobonds and Euronotes were denominated in U.S. dollars, 22 percent in euros, 2 percent in Canadian dollars, 1 percent in Australian dollars and pounds sterling, and the remaining 2 percent in other currencies.

Some Eurobonds are denominated in more than one currency in order to give the lender a choice of the currencies in which to be repaid, thus providing some exchange rate protection to the lender. For this benefit, the lender may be willing to lend at a somewhat lower rate. A large issue of Eurobonds and Euronotes is usually negotiated by a group (called a *syndicate*) of banks so as to spread the credit risk among numerous banks in many countries. Eurobonds and Euronotes usually have floating rates. That is, the interest rates charged are re-fixed, usually every three or six months, in line with changes in market conditions. After an issue of Eurobonds and Euronotes is sold by syndicate, a secondary market in the international note or bond emerges in which investors can sell their holdings. (The market in which the initial issue was sold is appropriately called the *primary market*.)

Interest rates on Eurocredits are expressed as a mark-up or spread over LIBOR (the London Interbank Offer Rate) or EUROBOR (the Brussels-set rate) at which Eurobanks lend funds to one another. The spread varies according to the creditworthiness of the borrower and ranges from 1 percent for best or prime borrowers to 2 percent for borrowers with weak credit ratings. Often, weaker borrowers can negotiate a lower spread by paying various fees up front. These are a management fee for the bank or banks organizing the syndication, a participation fee to all participating banks based on the amount lent by each, as well as a commitment fee on any undrawn portion of the loan. Because of the size and rapid growth of the Eurocurrency, and Eurobond and Euronote markets, and the resulting integration of domestic and international financial markets, we are approaching a truly global banking system.

SUMMARY

1. Foreign exchange markets are the markets where individuals, firms, and banks buy and sell foreign currencies or foreign exchange. The foreign exchange market for any currency, say the U.S. dollar, is comprised of all the locations, such as London, Paris, Zurich, Frankfurt, Singapore, Hong Kong, and Tokyo, as well as New York, where dollars are bought and sold for other currencies. These different monetary centers are connected by a telephone network and video screens, and are in constant contact with one another.

2. The principal function of foreign exchange markets is the transfer of purchasing power from one nation and currency to another. The demand for foreign exchange arises from the desire to import or purchase goods and services from other nations and to make investments abroad. The supply of foreign exchange comes from exporting or selling goods and services to other nations and from the inflow of foreign investments. About 90 percent of all foreign exchange transactions today, however, are undertaken by foreign currency traders and speculators. A nation's commercial banks operate as clearinghouses for the foreign exchange demanded and supplied. Commercial banks then even out their excess supply of or demand for foreign exchange with other commercial banks through the intermediation of foreign exchange brokers. The nation's central bank then acts as the lender or borrower of last resort.

3. The exchange rate (R) is defined as the domestic currency price of the foreign currency. Under a flexible exchange rate system of the type in existence since 1973, the equilibrium exchange rate is determined at the intersection of the nation's aggregate demand and supply curves for the foreign currency. If the domestic currency price of the foreign currency rises, we say that the domestic currency depreciated. In the opposite case, we say that the domestic currency appreciated (and the foreign currency depreciated). Arbitrage refers to the purchase of a currency where it is cheaper for immediate resale where it is more expensive in order to make a profit. This equalizes exchange rates and ensures consistent cross rates in all monetary centers, unifying them into a single market. Under a managed floating exchange rate system (of the type in operation today), the loss of official reserves only indicates the degree of official intervention in foreign exchange markets to influence the level and movement of exchange rates, and not the balance-of-payments deficit.

4. A spot transaction involves the exchange of currencies for delivery within two business days. A forward transaction is an agreement to purchase for delivery at a future date (usually one, three, or six months hence) a specified amount of a foreign currency at a rate agreed upon today (the forward rate). When the forward rate is lower than the spot rate, the foreign currency is said to be at a forward discount of a certain percentage per year. In the opposite case, the foreign currency is said to be at a forward premium. Currency swap is a spot sale of a currency combined with a forward repurchase of the same currency. A foreign exchange futures is a forward contract for standardized currency amounts and selected calendar dates traded on an organized market (exchange). A foreign exchange option is a contract specifying the right to buy or sell a standard amount of a traded currency at or before a stated date.

5. Because exchange rates usually change over time, they impose a foreign exchange risk on anyone who expects to make or receive a payment in a foreign currency at a future date. The covering of such an exchange risk is called hedging. Speculation is the opposite of hedging. It refers to the taking of an open position in the expectation of making a profit. Speculation can be stabilizing or destabilizing. Hedging and speculation can take place in the spot, forward, future, or options markets—usually in the forward market.

6. Interest arbitrage refers to the international flow of short-term liquid funds to earn higher returns abroad. One aspect of this is carry trade. Covered interest arbitrage refers to the spot purchase of the foreign currency to make the investment and an offsetting simultaneous forward sale of the foreign currency to cover the foreign exchange risk. The net return from covered interest arbitrage is usually equal to the interest differential in favor of the foreign monetary center minus the forward discount on the foreign currency. As covered interest arbitrage continues, the net gain is reduced and finally eliminated. When the net gain is zero, the currency is said to be at interest parity. Foreign exchange markets are said to be efficient if forward rates accurately predict future spot rates.

7. Eurocurrency refers to commercial bank deposits outside the country of their issue, or even in the same country, if exempted from regulations imposed on domestic deposits. The Eurocurrency market has grown very rapidly during the past three decades. The reasons for its existence and growth are (1) the higher interest rates paid on Eurocurrency deposits, (2) the convenience it provides for international corporations, and (3) the ability to escape national monetary controls. Eurobanks do not, in general, create money, but they are essentially financial intermediaries bringing together lenders and borrowers. The Eurocurrency market can create great instability in exchange and other financial markets. Eurobonds are long-term debt securities sold outside the borrower's country in a currency other than the currency of the nation where the bonds are sold. Euronotes are medium-term financial instruments falling somewhat between short-term Eurocurrency and Eurobonds.

A LOOK AHEAD

The next chapter examines exchange rate determination, both in the long run and in the short run, and discusses the reasons for the large exchange rate disequilibria and great volatility in foreign exchange markets during the past three decades. We also evaluate the accuracy of exchange rate forecasting in the real world.

KEY TERMS

Appreciation, p. 429
Arbitrage, p. 431
Carry trade, p. 445
Covered interest arbitrage, p. 444
Covered interest arbitrage margin (CIAM), p. 449
Covered interest arbitrage parity (CIAP), p. 447
Cross-exchange rate, p. 429
Depreciation, p. 429
Destabilizing speculation, p. 443
Effective exchange rate, p. 431
Efficiency of foreign exchange markets, p. 450
Euro, p. 427
Eurobonds, p. 455
Eurocurrency, p. 451
Eurocurrency market, p. 451
Euronotes, p. 455
Exchange rate, p. 428
Foreign exchange futures, p. 436
Foreign exchange market, p. 423
Foreign exchange option, p. 436
Foreign exchange risk, p. 440
Foreign exchange swaps, p. 435
Forward discount, p. 435
Forward premium, p. 435
Forward rate, p. 434
Hedging, p. 441
Interest arbitrage, p. 444
Offshore deposits, p. 451
Seignorage, p. 425
Speculation, p. 442
Spot rate, p. 434
Stabilizing speculation, p. 443
Uncovered interest arbitrage, p. 444
Vehicle currency, p. 425

QUESTIONS FOR REVIEW

1. What are foreign exchange markets? What is their most important function? How is this function performed?
2. What are the four different levels of participants in foreign exchange markets? What are the other functions of foreign exchange markets?
3. What is meant by the exchange rate? How is the equilibrium exchange rate determined under a flexible exchange rate system?
4. What is meant by a depreciation of the domestic currency? an appreciation? What is the cross exchange rate? What is the effective exchange rate?
5. What is arbitrage? What is its result? What is triangular arbitrage? What are cross rates?
6. Why is the measure of the balance-of-payments deficit or surplus not strictly appropriate under a flexible exchange rate?
7. What is meant by a spot transaction and the spot rate? a forward transaction and the forward rate? What is meant by a forward discount? forward premium? What is a currency swap? What is a foreign exchange futures? a foreign exchange option?

8. What is meant by foreign exchange risk? How can foreign exchange risks be covered in the spot, forward, futures, or options markets? Why does hedging not usually take place in the spot market?

9. What is meant by speculation? How can speculation take place in the spot, forward, futures, or options markets? Why does speculation not usually take place in the spot market? What is stabilizing speculation? destabilizing speculation?

10. What is interest arbitrage? uncovered interest arbitrage? covered interest arbitrage? How is interest arbitrage covered in the forward market? Why does the net gain from covered interest arbitrage tend to diminish as covered interest arbitrage continues?

11. What is meant by the foreign currency being at covered interest arbitrage parity (CIAP)? What are some of the forces that can prevent the achievement of CIAP?

12. (a) What is a Eurocurrency? (b) Why would *offshore deposits* be a more appropriate term? (c) Why is the spread between lending and borrowing rates lower on Eurocurrencies than on commercial bank dollar deposits in the United States?

13. (a) Are Eurocurrencies money? (b) Do Eurobanks create money? (c) What are the most serious problems created by the existence of Eurocurrencies?

14. What is the difference between Eurocurrencies on the one hand and Eurobonds and Euronotes on the other?

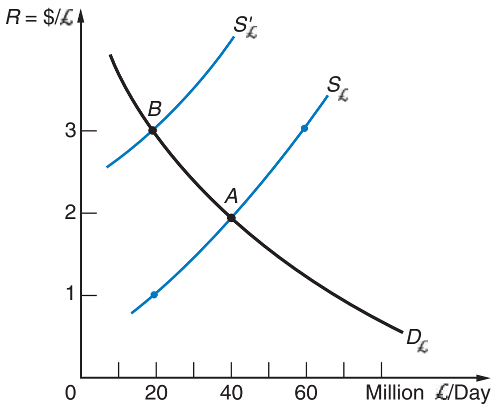
PROBLEMS

1. From the following figure, determine

(a) the equilibrium exchange rate between the dollar and the pound sterling and the equilibrium quantity of pounds with supply curve $S_£$ and $S'_£$ under a flexible exchange rate system.

(b) If the United States wanted to maintain the exchange rate at $\$3 = £1$ with supply curve $S_£$, how much pound reserves would the U.S. central bank gain or lose per day?

2. **(a)** Redraw demand curve for pounds $D_£$ and supply curve of pounds $S_£$ as in the figure of Problem 1 and draw on it another supply curve for pounds (label it $S^*_£$) that intersects $D_£$ at \$1 = £1 (label the point of intersection C).



(b) Assuming a flexible exchange rate system, determine the equilibrium exchange rate and equilibrium quantity of pounds with $S^*_£$.

(c) If the United States wanted to maintain a fixed exchange rate of $R = 1.5$ with $S^*_£$, indicate the amount of pound reserves that the U.S. central bank would gain or lose per day.

3. Assume the following exchange rates:

$$\$2 = £1 \text{ in New York}$$
$$¥410 = £1 \text{ in London}$$
$$¥200 = \$1 \text{ in Tokyo}$$

Indicate how profitable triangular, or three-point, arbitrage can take place.

4. **(a)** Identify the forces at work that will make the cross exchange rates consistent in currency arbitrage in the previous problem.

(b) What are the consistent cross-rates in Problem 3?

*5. Calculate the forward discount or premium for the following spot and three-month forward rates:

(a) $SR = \$2.00/£1$ and $FR = \$2.01/£1$

(b) $SR = \$2.00/£1$ and $FR = \$1.96/£1$

6. Calculate the forward discount or premium for the following spot and three-month forward rates:

(a) SR = SF2/€1 and SF2.02/€1 where SF is the Swiss franc and € is the euro

(b) SR = ¥200/$1 and FR = ¥190/$1

7. Assume that SR = $2/£1 and the three-month FR = $1.96/£1. How can an importer who will have to pay £10,000 in three months hedge the foreign exchange risk?

8. For the given in Problem 7, indicate how an exporter who expects to receive a payment of £1 million in three months hedges the foreign exchange risk.

***9.** Assume that the three month FR = $2.00/£1 and a speculator believes that the spot rate in three months will be SR = $2.05/£1. How can a person speculate in the forward market? How much will the speculator earn if he or she is correct?

10. If the speculator of Problem 9 believes that the spot rate in three months will be SR = $1.95/£1, how can he or she speculate in the forward market? How much will the speculator earn if he or she is correct? What will the result be if in three months SR = $2.05/£1 instead?

***11.** If the positive interest rate differential in favor of a foreign monetary center is 4 percent per year and the foreign currency is at a forward discount of 2 percent per year, roughly how much would an interest arbitrageur earn from the purchase of foreign three-month treasury bills if he or she covered the foreign exchange risk?

12. For the given of Problem 11, indicate:

(a) How much would an interest arbitrageur earn if the foreign currency were at a forward premium of 1 percent per year?

(b) What would happen if the foreign currency were at a forward discount of 6 percent per year?

13. With reference to Figure 14.4, explain (a) why there will be an arbitrage inflow at points B and B' and (b) the forces that tend to eliminate the net gain as arbitrage inflows continue.

14. Explain why even when CIAP holds, investors in different monetary centers do not necessarily receive the same returns on their financial investments.

*= Answer provided at www.wiley.com/college/salvatore.

APPENDIX

A14.1 Derivation of the Formula for the Covered Interest Arbitrage Margin

In this appendix, we derive the formula for calculating the covered interest arbitrage margin (CIAM). Starting with Formula (14A-1):

$$K(1 + i/4) \gtreqless (K/SR)(1 + i^*/4)FR \qquad (14\text{A-}1)$$

where K = amount of capital invested
i = domestic interest rate per year
i^* = foreign interest rate per year
SR = spot rate
FR = forward rate

The left-hand side of Formula (14A-1) gives the value of the investment (the original capital invested plus the interest earned) when K amount of capital is invested domestically for three months. The right-hand side gives the domestic currency value of the investment (the original capital invested plus the interest earned) when the same amount of capital is invested abroad for three months with the foreign exchange risk covered. Specifically, the right-hand side of the formula gives the foreign currency value of the investment, times one plus the interest earned abroad for three months, times the forward rate (to reconvert the invested capital plus the interest earned back into the domestic currency). Investors will invest domestically if the left-hand side of the formula is larger than the right-hand side; they will invest abroad if the right-hand side of the formula is larger than the left-hand side; and they are indifferent if the two sides are equal.

According to the theory of covered interest arbitrage (CIA), an arbitrage outflow or inflow will proceed until no net gain remains (i.e., until covered interest arbitrage parity or CIAP is reached). Thus, at CIAP the two sides of Formula (14A-1) would be equal. By treating Formula (14A-1) as an equation and manipulating it algebraically, we can derive the formula for the covered interest arbitrage margin (CIAM). In doing this, it is convenient to divide both sides by K and omit, for the moment, the division of i and i^* by 4. This will give us the CIAM per dollar per year. By then multiplying the CIAM obtained by the capital invested (K) and dividing by 4, we get the extra dollar earnings in percentage for the three months of the investment with the foreign exchange risk covered.

Treating Formula (14A-1) as an equation, and dividing both sides by K and omitting the division of i and i^* by 4 as explained previously, we get Equation (14A-2):

$$1 + i = (FR/SR)\ (1 + i^*) \tag{14A-2}$$

Manipulating Equation (14A-2) algebraically, we obtain:

$$\begin{aligned}(1 + i)/(1 + i^*) &= FR/SR \\ [(1 + i)/(1 + i^*)] - 1 &= [FR/SR] - 1 \\ (1 + i - 1 - i^*)/(1 + i^*) &= (FR - SR)/SR \\ (i - i^*)/(1 + i^*) &= (FR - SR)/SR\end{aligned}$$

Solving for FR, we get Formula (14A-3) to calculate the forward rate at CIAP:

$$FR = [(i - i^*)/(1 + i^*)]SR + SR \tag{14A-3}$$

Thus, the covered interest arbitrage margin (CIAM) is:

$$CIAM = (i - i^*)/(1 + i^*) - (FR - SR)/SR \tag{14A-4}$$

This is Formula (14-2) given in Section 14.6D. The first fraction on the right-hand side of Formula (14A-4) is the domestic-foreign interest rate differential weighted by 1 plus the foreign interest rate. The second fraction is the forward discount on the foreign currency weighted by the spot rate. At CIAP, the value of the two fractions is equal, so that CIAM equals zero. Since Formula (14A-4) refers to a whole year, the CIAM for three months is CIAM/4.

Problem Using the data on i, i^*, SR, and FR in the numerical example at the end of Section 14.6D, determine the dollar amount (principal plus interest) that a U.S. investor will get back by investing $100,000 for three months in (a) U.S. treasury bills or (b) EMU treasury bills with the foreign exchange risk covered. How would your answer to Part (b) differ if you estimated the CIAM as in Section 14.6B?

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INTERNet

The basics of the foreign exchange market in the United States can be found at:

http://www.newyorkfed.org/education/addpub/usfxm/chap2.pdf

Data on exchange rates by country and region, cross-rates, and the ability to calculate the exchange rate between any two currencies can be found at:

http://www.x-rates.com/

The monthly trade-weighted exchange rate of the dollar, as well as data on U.S. interest rates, can be obtained by clicking, respectively, on "Exchange Rates" and "Interest Rates" (for covered interest arbitrage) on the Federal Reserve Bank of St. Louis website at:

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The carry trade is examined at:

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http://www.fxwords.com/c/carry-trade.htm

http://www.moneyweek.com/investments/why-is-the-carry-trade-so-dangerous

Exchange Rate Determination

chapter 15

LEARNING GOALS:

After reading this chapter, you should be able to:

- Understand the purchasing-power parity theory and why it does not work in the short run
- Understand how the monetary and the portfolio balance models of the exchange rate work
- Understand the causes of exchange rate overshooting
- Understand why exchange rates are so difficult to forecast

15.1 Introduction

In this chapter, we examine modern exchange rate theories. These theories are based on the monetary approach and the asset market or portfolio balance approach to the balance of payments that have been developed since the late 1960s. These theories view the exchange rate, for the most part, as a purely financial phenomenon. They also seek to explain the great short-run volatility of exchange rates and their tendency to overshoot their long-run equilibrium level, which have often been observed during the past four decades.

These modern exchange rate theories may be distinguished from traditional exchange rate theories (discussed in Chapters 16 and 17), which are based on trade flows and help explain exchange rate movements only in the long run or over the years. Since the advent of floating rates in 1973, international financial flows have increased tremendously and are now far larger than trade flows. Therefore, it is only natural that interest shifted toward monetary theories of exchange rate determination. Traditional exchange rate theories are still important, however, especially in explaining exchange rates in the long run.

We begin in Section 15.2 by presenting the purchasing-power parity theory, which provides the long-run framework for the monetary and asset market or portfolio balance approaches to exchange rate determination. Section 15.3 then examines the monetary approach to the balance of payments and exchange rate determination. Section 15.4 presents the portfolio balance approach to exchange rate determination. Section 15.5 examines exchange rate dynamics and seeks to explain the tendency of short-run exchange rates to overshoot their long-run equilibrium level. Finally, Section 15.6 presents empirical evidence on the monetary approach and the portfolio balance approach, and on exchange rate forecasting. The appendix to the chapter discusses a formal model of the monetary approach and portfolio balance model of exchange rate determination.

15.2 Purchasing-Power Parity Theory

In this section, we examine the purchasing-power parity (PPP) theory and evaluate its usefulness in explaining exchange rates. The purchasing-power parity (PPP) theory was elaborated and brought back into use by the Swedish economist *Gustav Cassel* in order to estimate the equilibrium exchange rates at which nations could return to the gold standard after the disruption of international trade and the large changes in relative commodity prices in the various nations caused by World War I. There is an absolute and a relative version of the PPP theory. These will be examined in turn.

15.2A Absolute Purchasing-Power Parity Theory

The absolute purchasing-power parity theory postulates that the equilibrium exchange rate between two currencies is equal to the ratio of the price levels in the two nations. Specifically:

$$R = \frac{P}{P^*} \tag{15-1}$$

where R is the exchange rate or spot rate and P and P^* are, respectively, the general price level in the home nation and in the foreign nation. For example, if the price of one bushel of wheat is \$1 in the United States and €1 in the European Monetary Union, then the exchange rate between the dollar and the pound should be $R = \$1/€1 = 1$. That is, according to the law of one price, a given commodity should have the same price (so that the purchasing power of the two currencies is at parity) in both countries when expressed in terms of the same currency. If the price of one bushel of wheat in terms of dollars were \$0.50 in the United States and \$1.50 in the European Monetary Union, firms would purchase wheat in the United States and resell it in the European Monetary Union, at a profit. This commodity arbitrage would cause the price of wheat to fall in the European Monetary Union and rise in the United States until the prices were equal, say \$1 per bushel, in both economies (in the absence of obstructions to the flow of trade or subsidies and abstracting from transportation costs). Commodity arbitrage thus operates just as does currency arbitrage in equalizing commodity prices throughout the market.

This version of the PPP theory can be very misleading. There are several reasons for this. First, it appears to give the exchange rate that equilibrates trade in goods and services while completely disregarding the capital account. Thus, a nation experiencing capital outflows would have a deficit in its balance of payments, while a nation receiving capital inflows would have a surplus if the exchange rate were the one that equilibrated international trade in goods and services. Second, this version of the PPP theory will not even give the exchange rate that equilibrates trade in goods and services because of the existence of many nontraded goods and services.

Nontraded goods include products, such as cement and bricks, for which the cost of transportation is too high for them to enter international trade, except perhaps in border areas. Most services, including those of mechanics, hair stylists, family doctors, and many others, also do not enter international trade. International trade tends to equalize the prices of traded goods and services among nations but not the prices of nontraded goods and services. Since the general price level in each nation includes both traded and nontraded commodities, and prices of the latter are not equalized by international trade, the absolute PPP theory will not lead to the exchange rate that equilibrates trade. Furthermore, the absolute PPP theory fails to take into account transportation costs or other obstructions to the free flow of international trade. As a result, the absolute PPP theory cannot be taken too seriously (see Case Studies 15-1 and 15-2). Whenever the purchasing-power parity theory is used, it is usually in its relative formulation.

15.2B Relative Purchasing-Power Parity Theory

The more refined relative purchasing-power parity theory postulates that the *change* in the exchange rate over a period of time should be proportional to the *relative* change in the price levels in the two nations over the same time period. Specifically, if we let the subscript 0 refer to the base period and the subscript 1 to a subsequent period, the relative PPP theory postulates that

$$R_1 = \frac{P_1/P_0}{P^*{}_1/P^*{}_0} \cdot R_0 \qquad (15\text{-}2)$$

where R_1 and R_0 are, respectively, the exchange rates in period 1 and in the base period.

For example, if the general price level does not change in the foreign nation from the base period to period 1 (i.e., $P^*{}_1/P^*{}_0 = 1$), while the general price level in the home nation increases by 50 percent, the relative PPP theory postulates that the exchange rate (defined as the home-currency price of a unit of the foreign nation's currency) should be 50 percent higher (i.e., the home nation's currency should depreciate by 50 percent) in period 1 as compared with the base period.

Note that if the absolute PPP held, the relative PPP would also hold, but when the relative PPP holds, the absolute PPP need not hold. For example, while the very existence of capital flows, transportation costs, other obstructions to the free flow of international trade, and government intervention policies leads to the rejection of the absolute PPP, only a *change* in these would lead the relative PPP theory astray.

However, other difficulties remain with the relative PPP theory. One of these results from the fact (pointed out by *Balassa and Samuelson* in 1964) that the ratio of the price of nontraded to the price of traded goods and services is systematically higher in developed nations than in developing nations. The Balassa–Samuelson effect results from labor productivity in traded goods being higher in developed than in developing countries, but about the same in many nontraded goods and services sectors (for example, haircutting). To remain in nontraded goods and services sectors in developed nations, however, labor must receive wages comparable to the high wages in *traded*-goods sectors. This makes the price of nontraded goods and services systematically higher in developed than in developing

CASE STUDY 15-1 Absolute Purchasing-Power Parity in the Real World

Figure 15.1 shows the actual exchange rate of the dollar in terms of the German mark (i.e., DM/$ prevailing in the market—the colored curve) and the PPP exchange rate (measured by the ratio of the German to the U.S. consumer price index—the black curve) during the flexible exchange rate period since 1973. (Since the beginning of 1999, the fluctuation of the DM/$ reflects the fluctuation of the euro with respect to the dollar.) For the absolute PPP theory to hold, the two curves should coincide. As we can see from the figure, however, the curves diverge widely. The dollar was undervalued (the colored curve was below the black curve) from 1973 to 1980, 1986 to 2000, and 2003 to 2011, and was overvalued from 1981 to 1985 and 2001 and 2002. The figure shows that at its peak (at the beginning of 1985), the dollar was overvalued by nearly 40 percent in terms of marks. Only at the beginning of 1981 and 2001, and at the end of 1985 and 2002, do the curves cross and the two currencies were at parity.

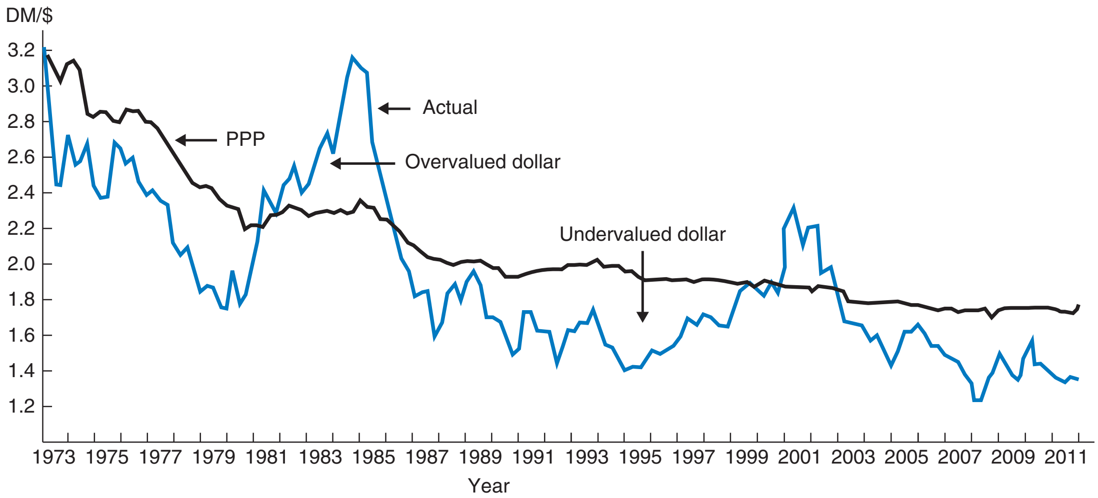

FIGURE 15.1. Actual and PPP Exchange Rate of the Dollar, 1973–2011.
The colored curve measures the dollar exchange rate (defined as DM/$) prevailing in the market, and the black curve measures the PPP exchange rate (measured by the ratio of the German to the U.S. consumer price index) from 1973 to 2011. The figure shows that the dollar was undervalued during 1973–1980, 1986–2000, and 2003–2011, and was overvalued during 1981–1985 and in 2001 and 2002. (Since the beginning of 1999, the fluctuation in DM/$ reflects the fluctuation of the euro with respect to the dollar.)
Source: International Monetary Fund, *International Financial Statistics* (Washington, D.C.: IMF, various issues).

nations. For example, the price of a haircut may be $10 in the United States but only $1 in Brazil.

Since the general price index includes the prices of both traded and nontraded goods and services, and prices of the latter are not equalized by international trade but are relatively higher in developed nations, the relative PPP theory will tend to predict overvalued exchange rates for developed nations and undervalued exchange rates for developing nations, with distortions being larger the greater the differences in the levels of development. This has been confirmed by *Rogoff* (1996) and *Choudri and Khan* (2005).

CASE STUDY 15-2 The Big Mac Index and the Law of One Price

According to the absolute PPP theory, the dollar price of a particular product—say, McDonald's Big Mac hamburger—should be the same in other countries as in the United States if exchange rates were equal to the ratio of the price level in the United States and other countries. From the second column in Table 15.1, however, we see that the dollar price of a Big Mac varied greatly across countries. On January 12, 2012, the Big Mac was most expensive in Norway ($6.79) and cheapest in India ($1.62), as compared with $4.20 in the United States.

The third column of the table gives the implied purchasing-power parity (PPP) of the dollar with respect to the various currencies. This is the exchange rate that would make the price of a hamburger the same in the various countries or regions as in the United States. For example, the price of £3.49 for a hamburger in the Euro area implies a dollar-euro exchange rate of 1.2034 (rounded off to 1.20 in Table 15.1) to equalize the price of a hamburger of $4.20 (£3.49 × 1.2034 = $4.20) in the two regions. This makes the actual dollar-euro exchange rate of $1.27/£ about 6 percent [(1.27 − 1.2034)/1.2034 = 5.53 percent, rounded off to 6 percent in Table 15.1] overvalued with respect to the dollar.

Since the dollar price of a Big Mac was $6.79 in Norway as compared with $4.20 in the United States, the Norwegian kroner was 62 percent ($6.79/$4.20) overvalued with respect to the U.S. dollar on January 12, 2012. The table also shows that the Swiss franc was also overvalued by 62 percent, the Swedish krone by 41 percent, and the Brazilian real by 35 percent. On the other hand, the British pound was 9 percent undervalued with respect to the U.S. dollar, the Mexican peso 36 percent, the Russian rouble 39 percent, the Chinese renminbi or yuan 42 percent, and the Indian rupee 61 percent. Norway was therefore the most expensive country for Americans to visit and India the least expensive (among the countries listed in the table).

TABLE 15.1. Big Mac Prices and Exchange Rates, January 12, 2012

	Big Mac Prices				
	In Local Currency	In U.S. Dollars	Implied PPP[a] of the Dollar	Actual Dollar Exchange Rate: Jan. 12, 2012	Under (−)/Over (+) against the Dollar, %
United States[b]	$4.20	$4.20	–	–	–
Argentina	Peso 20.0	$4.64	4.77	4.31	10
Australia	A$4.80	$4.54	1.14	0.97	18
Brazil	Real 10.25	$5.68	2.44	1.81	35
Britain[c]	£2.49	$3.82	1.65	1.54	−5
Canada	C$4.73	$4.63	113	1.02	10
Chile	Peso 2,050	$4.05	488	505	−3
China[d]	Yuan 15.4	$2.44	3.67	6.32	−42
Colombia	Preso 8,400	$4.54	2001	1852	8
Czech Republic	Koruna 70.22	$3.45	15.73	20.4	−18
Denmark	DK 31.5	$5.37	7.50	5.86	28
Egypt	Pound 15.5	$2.57	3.69	6.04	−39
Euro area[e]	3.49	$4.43	1.20	1.27[f]	5
Hong Kong	HK$16.5	$2.12	3.93	7.77	−45
Hungary	Forint 64.5	$2.63	153.67	245	−37
India	Rupee 84.0	$1.62	20.01	51.9	−61

(continued)

(continued)

CASE STUDY 15-2 Continued

TABLE 15.1. *(continued)*

	Big Mac Prices				
	In Local Currency	In U.S. Dollars	Implied PPP[a] of the Dollar	Actual Dollar Exchange Rate: Jan. 12, 2012	Under (−)/Over (+) against the Dollar, %
Indonesia	Rupiah 22.534	$2.46	5369	9160	−41
Israel	Shekel 15.9	$4.13	3.79	3.85	−2
Japan	Yen 320	$4.16	76.24	76.9	−1
Malaysia	Ringgit 7.35	$2.34	1.75	3.14	−44
Mexico	Peso 37	$2.70	8.82	13.68	−36
Norway	Kroner 41	$6.79	9.77	6.04	52
Pakistan	Rupee 260	$2.89	61.95	50.1	−31
Peru	Sol 10.0	$3.71	2.38	2.69	−12
Philippines	Peso 118	$2.68	28.11	44.0	−36
Poland	Zhoty 9.10	$2.58	2.17	3.52	−38
Russia	Rouble 81.0	$2.55	19.30	31.8	−39
Saudi Arabia	Riyal 10.0	$2.67	2.38	3.75	−36
Singapore	S$4.85	$3.75	1.16	1.29	−11
South Africa	Rand 19.55	$2.45	4.75	8.13	−42
South Korea	Won 3,700	$3.19	882	1158	−24
Sweden	SKr 41	$5.91	9.77	6.53	41
Switzerland	SFr 6.50	$6.81	1.55	0.56	52
Taiwan	NTS 75.0	$2.50	17.87	30.0	−40
Thailand	Baht 78	$2.46	18.58	31.8	−41
Turkey	Lire 6.60	$3.54	1.57	1.86	−16

[a] Purchasing-power parity: local price divided by price in the United States;
[b] Average of four cities;
[c] Dollars per pound;
[d] Average of 5 cities;
[e] Weighted average of prices in euro area;
[f] Dollars per euro.
Source: ''2012 Big Mac Index,'' *The Economist*, January 12, 2009.

Significant structural changes also lead to problems with the relative PPP theory. For example, the PPP theory indicated that the British pound was undervalued (i.e., the exchange rate of the pound was too high) immediately after World War I, when it was obvious that the opposite was the case (and the exchange rate of the pound should have been even higher). The reason was that the United Kingdom had liquidated many of its foreign investments during the war, so that the equilibrium exchange rate predicted by the relative PPP theory (which did not take into consideration the drop in earnings from foreign investments) would have left a large deficit in the U.K. balance of payments after the war. Case Study 15-3 provides a simple test of the relative PPP theory. More formal and rigorous tests are discussed in the next subsection.

CASE STUDY 15-3 Relative Purchasing-Power Parity in the Real World

Figure 15.2 shows the relationship between changes in relative national price levels and changes in exchange rates for 18 industrial nations from 1973 to 2011 (the period of flexible exchange rates). The horizontal axis measures the average inflation rate in each country minus the average inflation rate in the United States (so that positive values refer to a higher average inflation rate in the nation than in the United States). The vertical axis measures changes in the foreign exchange rate, defined as the *foreign*-currency price of the U.S. dollar. Thus, an increase in the foreign exchange rate refers to a depreciation of the *foreign* currency relative to the U.S. dollar, while a decrease in the exchange rate refers to an appreciation of the foreign currency.

According to the relative purchasing-power parity (PPP) theory, nations with higher inflation rates than in the United States should experience depreciating currencies, while nations with lower inflation rates should have appreciating currencies. The figure shows that this is indeed the case over the 38-year period examined. That is, countries with higher inflation rates than the United States experienced depreciating currencies with respect to the U.S. dollar, while countries with lower inflation rates experienced appreciating currencies. For the theory to hold perfectly, however, the plotted points in Figure 15.2 should fall on a straight line with a positive slope of 1. Since this is not the case, the relative PPP theory holds only approximately.

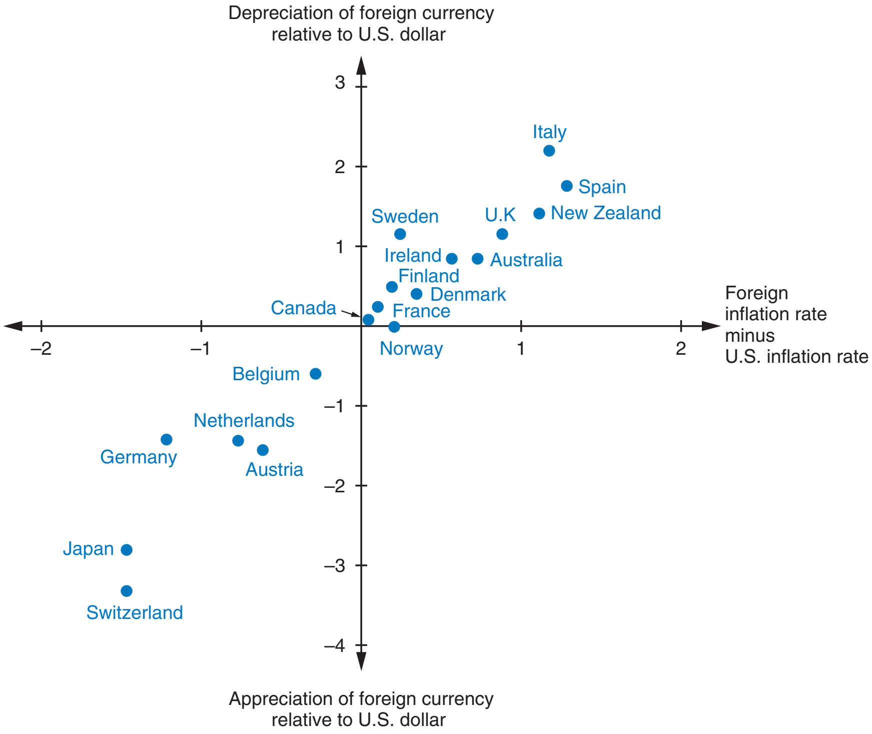

FIGURE 15.2. Inflation Differentials and Exchange Rates, 1973–2011.
Positive values along the horizontal axis refer to higher average inflation rates in the nation than in the United States. Positive values along the vertical axis refer to a depreciating currency relative to the U.S. dollar. Since nations with higher inflation rates generally experienced depreciating currencies the relative PPP theory seems to be broadly confirmed in the long run. Since 1999, changes in the exchange rates of EMU countries reflect the changes in the euro/dollar exchange rate.
Source: International Monetary Fund, *International Financial Statistics*, various issues.

15.2c Empirical Tests of the Purchasing-Power Parity Theory

The movement to a floating exchange rate system after 1973 stimulated a great resurgence of interest in the purchasing-power parity theory and led to numerous empirical studies to test the validity of the theory.

Frenkel (1978) provided empirical evidence on the long-run validity of the PPP theory during the high-inflation years of the 1920s, and so did *Kravis and Lipsey* (1978) for the 1950–1970 period, and *McKinnon* (1979) for the 1953–1977 period. On the other hand, *Frenkel* (1981) found that the PPP theory collapsed during the 1970s, especially in the latter part of the 1970s, and so did *Levich* (1985) and *Dornbusch* (1987) for the 1980s.

Frankel (1986 and 1990) has suggested that researchers should utilize data over many decades to properly test the PPP theory because deviations from purchasing-power parity die out only very slowly. Utilizing annual data on the dollar/pound exchange rate over the 1869–1984 period, *Frankel* showed that it took between four and five years for one-half of the deviations from PPP to die out and that only about 15 percent of the deviations from PPP were eliminated per year. *Lothian and Taylor* (1996), using data from 1790 to 1990 for the dollar/pound and the franc/pound exchange rates, confirmed Frankel's results, as did *Frankel and Rose* (1995) using annual data for 150 countries from 1948 to 1992, *MacDonald* (1999) using 1960 to 1996 data, *Taylor* (2002) using annual data for 20 countries (the G-7 countries and 13 other countries) over the 1882–1996 period, and by *Cashin and McDermott* (2002) for 20 industrial countries over the 1973–2002 period. *Taylor and Taylor* (2004) review this empirical evidence and support the above results and conclusions. *Cashin and McDermott* (2006) extend and confirm their earlier conclusions for 90 developed and developing countries over the 1973–2002 period.

Why do deviations from PPP die out so slowly? One possible explanation given by *Rogoff* (1996 and 1999) is that, despite all the globalization that has occurred during the past two or three decades, international commodity markets are still much less integrated than national commodity markets. This is due to the existence of transportation costs, actual or threatened trade protection, information costs, and very limited international labor mobility. As a consequence of various adjustment costs, exchange rates can move a great deal without triggering any immediate and large response in relative domestic prices.

We can therefore come to the following overall conclusions with regard to the empirical relevance of the PPP theory. (1) We expect the PPP to work well (i.e., the law of one price to hold) for highly traded *individual* commodities, such as wheat or steel of a particular grade, but less well for all traded goods together, and not so well for all goods (which include many nontraded commodities). (2) For any level of aggregation, the PPP theory works reasonably well over very long periods of time (many decades) but not so well over one or two decades, and not well at all in the short run. (3) PPP works well in cases of purely monetary disturbances and in very inflationary periods but not so well in periods of monetary stability, and not well at all in situations of major structural changes.

These conclusions are very important not only for the relevance of the PPP theory itself, but also because, as we will see in the rest of this chapter, the PPP theory occupies a central position in the monetary and in the asset market or portfolio balance approaches to the balance-of-payments and exchange rate determination.

15.3 Monetary Approach to the Balance of Payments and Exchange Rates

In this section we examine the monetary approach to the balance of payments. This approach was started toward the end of the 1960s by *Robert Mundell and Harry Johnson* and became fully developed during the 1970s. The monetary approach represents an extension of domestic monetarism (stemming from the Chicago school) to the international economy in that it views the balance of payments as an *essentially monetary phenomenon*. That is, money plays the crucial role in the long run both as a disturbance and as an adjustment in the nation's balance of payments. In Section 15.3A we examine the monetary approach under fixed exchange rates, in Section 15.3B we look at the monetary approach under flexible exchange rates, in Section 15.3C we show how exchange rates are determined according to the monetary approach, and in Section 15.3D we discuss the effect of expectations on exchange rates.

15.3A Monetary Approach under Fixed Exchange Rates

The monetary approach begins by postulating that the demand for *nominal* money balances is positively related to the level of *nominal* national income and is stable in the long run. Thus, the equation for the demand for money can be written as:

$$M_d = kPY \tag{15-3}$$

where M_d = quantity demanded of nominal money balances
k = desired ratio of nominal money balances to nominal national income
P = domestic price level
Y = real output

In Equation (15-3), PY is the nominal national income or output (GDP). This is assumed to be at or to tend toward full employment in the long run. The symbol k is the desired ratio of nominal money balances to nominal national income; k is also equal to $1/V$, where V is the velocity of circulation of money or the number of times a dollar turns over in the economy during a year. With V (and thus k) depending on institutional factors and assumed to be constant, M_d is a stable and positive function of the domestic price level and real national income.

For example, if GDP $= PY =$ \$1 billion and $V = 5$ (so that $k = 1/V = 1/5$), then $M_d = (1/5)PY = (1/5)(\$1 \text{ billion}) = \$200$ million. Although not included in Equation (15-3), the demand for money is also related, but inversely, to the interest rate (i) or opportunity cost of holding inactive money balances rather than interest-bearing securities. Thus, M_d is directly related to PY and inversely related to i. (This more complete money demand function is formally presented in the appendix to this chapter.) To simplify the analysis, however, we assume for now that M_d is related only to PY, or the nation's nominal GDP, and will work with Equation (15-3).

On the other hand, the nation's supply of money is given by

$$M_s = m(D + F) \tag{15-4}$$

where M_s = the nation's total money supply
m = money multiplier
D = domestic component of the nation's monetary base
F = international or foreign component of the nation's monetary base

The domestic component of the nation's monetary base (D) is the domestic credit created by the nation's monetary authorities or the domestic assets backing the nation's money supply. The international or foreign component of the nation's money supply *(F)* refers to the international reserves of the nation, which can be increased or decreased through balance-of-payments surpluses or deficits, respectively. $D + F$ is called the monetary base of the nation, or *high-powered money*. Under a fractional-reserve banking system (such as we have today), each new dollar of D or F deposited in any commercial bank results in an increase in the nation's money supply by a multiple of \$1. This is the money multiplier, m, in Equation (15-4).

For example, a new deposit of \$1 in a commercial bank allows the bank to lend (i.e., to create demand deposits for borrowers) \$0.80, if the legal reserve requirement (LRR) is 20 percent. The \$0.80 lent by the first bank is usually used by the borrower to make a payment and ends up as a deposit in another bank of the system, which proceeds to lend 80 percent of it (\$0.64), while retaining 20 percent (\$0.16) as reserve. The process continues until the original \$1 deposit has become the reserve base of a total of \$1.00 + \$0.80 + \$0.64 + ... = \$5 in demand deposits (which are part of the nation's total money supply). The figure of \$5 is obtained by dividing the original deposit of \$1 by the legal reserve requirement of 20 percent, or 0.2. That is, \$1/0.2 = 5 = m. However, due to excess reserves and leakages, the real-world multiplier is likely to be smaller. In what follows, we assume for simplicity that the money multiplier (m) is constant over time.

Starting from a condition of equilibrium where $M_d = M_s$, an increase in the demand for money (resulting, say, from a once-and-for-all increase in the nation's GDP) can be satisfied either by an increase in the nation's domestic monetary base *(D)* or by an inflow of international reserves, or balance-of-payments surplus *(F)*. If the nation's monetary authorities do not increase D, the excess demand for money will be satisfied by an increase in F. On the other hand, an increase in the domestic component of the nation's monetary base *(D)* and money supply *(M_s)*, in the face of unchanged money demand *(M_d)*, flows out of the nation and leads to a fall in F (a deficit in the nation's balance of payments). Thus, a surplus in the nation's balance of payments results from an excess in the stock of money demanded that is not satisfied by an increase in the domestic component of the nation's monetary base, while a deficit in the nation's balance of payments results from an excess in the stock of the money supply of the nation that is not eliminated by the nation's monetary authorities but is corrected by an outflow of reserves.

For example, an increase in the nation's GNP from \$1 billion to \$1.1 billion increases M_d from \$200 million (1/5 of \$1 billion) to \$220 million (1/5 of \$1.1 billion). If the nation's monetary authorities keep D constant, F will ultimately have to increase (a surplus in the nation's balance of payments) by \$4 million, so that the nation's money supply also increases by \$20 million (the \$4 million increase in F times the money multiplier of m = 5). Such a balance-of-payments surplus could be generated from a surplus in the current account or the capital account of the nation. How this surplus arises is not important at this time, except to note that the excess demand for money will lead to a balance-of-payments surplus that increases M_s by the same amount. On the other hand, an excess in the stock of money supplied will lead to an outflow of reserves (a balance-of-payments deficit) sufficient to eliminate the excess supply of money in the nation.

The nation, therefore, has no control over its money supply under a fixed exchange rate system in the long run. That is, the size of the nation's money supply will be the one that is consistent with equilibrium in its balance of payments in the long run. Only a reserve-currency country, such as the United States, retains control over its money supply in the long run under a fixed exchange rate system because foreigners willingly hold dollars.

To summarize, a *surplus* in the nation's balance of payments *results* from an *excess in the stock of money demanded* that is not satisfied by domestic monetary authorities. On the other hand, a *deficit* in the nation's balance of payments *results* from an *excess in the stock of money supplied* that is not eliminated or corrected by the nation's monetary authorities. The nation's balance-of-payments surplus or deficit is temporary and self-correcting in the long run; that is, after the excess demand for or supply of money is eliminated through an inflow or outflow of funds, the balance-of-payments surplus or deficit is corrected and the international flow of money dries up and comes to an end. Thus, except for a currency-reserve country, such as the United States, the nation has no control over its money supply in the long run under a fixed exchange rate system.

15.3B Monetary Approach under Flexible Exchange Rates

Under a flexible exchange rate system, balance-of-payments disequilibria are immediately corrected by automatic changes in exchange rates without any international flow of money or reserves. Thus, under a flexible exchange rate system, the nation retains dominant control over its money supply and monetary policy. Adjustment takes place as a result of the change in domestic prices that accompanies the change in the exchange rate. For example, a deficit in the balance of payments (resulting from an excess money supply) leads to an automatic depreciation of the nation's currency, which causes prices and therefore the demand for money to rise sufficiently to absorb the excess supply of money and automatically eliminate the balance-of-payments deficit.

On the other hand, a surplus in the balance of payments (resulting from an excess demand for money) automatically leads to an appreciation of the nation's currency, which tends to reduce domestic prices, thus eliminating the excess demand for money and the balance-of-payments surplus. Whereas under fixed exchange rates, a balance-of-payments disequilibrium is defined as and results from an international flow of money or reserves (so that the nation has no control over its money supply in the long run), under a flexible exchange rate system, a balance-of-payments disequilibrium is immediately corrected by an automatic change in exchange rates and without any international flow of money or reserves (so that the nation retains dominant control over its money supply and domestic monetary policy).

The actual exchange value of a nation's currency in terms of the currencies of other nations is determined by the rate of growth of the money supply and real income in the nation relative to the growth of the money supply and real income in the other nations. For example, assuming zero growth in real income and the demand for money, as well as in the supply of money, in the rest of the world, the growth in the nation's money supply in excess of the growth in its real income and demand for money leads to an increase in prices and in the exchange rate (a depreciation of the currency) of the nation. Conversely,

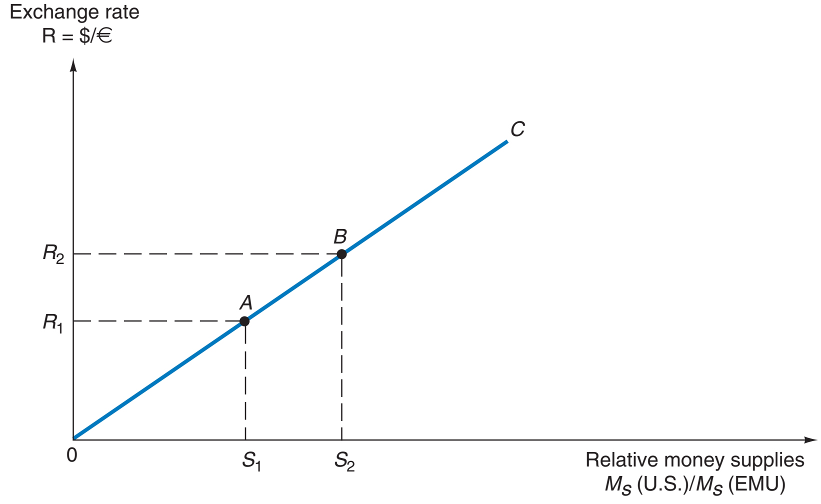

FIGURE 15.3. Relative Money Supplies and Exchange Rates.
Line OC shows the relationship between the money supply in the United States relative to the money supply in the European Monetary Union (EMU) [$S = M_s$(U.S.)/M_s(EMU)] and the dollar-euro exchange rate (R = \$/€). Line OC thus shows that a change from S_1 to S_2 causes a proportional change in R from R_1 to R_2.

an increase in the nation's money supply that falls short of the increase in its real income and demand for money tends to reduce prices and the exchange rate (an appreciation of the currency) of the nation. (The actual process by which exchange rates are determined under the monetary approach is examined in the next section.)

Thus, according to the monetary approach, a currency depreciation results from excessive money growth in the nation over time, while a currency appreciation results from inadequate money growth in the nation. Put differently, a nation facing greater inflationary pressure than other nations (resulting from more rapid growth of its money supply in relation to the growth in its real income and demand for money) will find its exchange rate rising (its currency depreciating—see Figure 15.3). On the other hand, a nation facing lower inflationary pressure than the rest of the world will find its exchange rate falling (its currency appreciating). According to *global monetarists*, the depreciation of the U.S. dollar and the appreciation of the German mark during the 1970s were due to excessive money growth and inflationary pressure in the United States, and to the much smaller rate of money growth and inflationary pressure in Germany than in the rest of the world.

With flexible exchange rates, the rest of the world is to some extent shielded from the monetary excesses of some nations. The nations with excessive money growth and depreciating currencies will now transmit inflationary pressures to the rest of the world primarily through their increased imports rather than directly through the export of money or reserves. This will take some time to occur and will depend on how much slack exists in the world economy and on structural conditions abroad.

Under a managed floating exchange rate system of the type in operation today, the nation's monetary authorities intervene in foreign exchange markets and either lose or accumulate international reserves to prevent an "excessive" depreciation or appreciation of the nation's currency, respectively. Under such a system, part of a balance-of-payments deficit is automatically corrected by a depreciation of the nation's currency, and part is corrected by a loss of international reserves (refer to Figure 14.2). As a result, the nation's money supply is affected by the balance-of-payments deficit, and domestic monetary policy loses some of its effectiveness. Under a managed float, the nation's money supply is similarly affected by excessive or inadequate growth of the money supply in other nations, although to a smaller extent than under a fixed exchange rate system. The operation of the present floating exchange rate system is discussed in detail in Chapters 20 and 21.

15.3c Monetary Approach to Exchange Rate Determination

In Section 14.3A, we defined the exchange rate as the domestic currency price of a unit of the foreign currency. With the dollar ($) as the domestic currency and the euro (€) as the foreign currency, the exchange rate (R) was defined as the number of dollars per euro, or R = $/€. For example, if R = $1/€1, this means that one dollar is required to purchase one euro, or if R = $1.20/€1, it would take $1.20 to get one euro.

If markets are competitive and if there are no tariffs, transportation costs, or other obstructions to international trade, then according to the law of one price postulated by the purchasing-power parity (PPP) theory, the price of a commodity must be the same in the United States as in the European Monetary Union (EMU). That is, $P_X(\$) = RP_X(€)$. For example, if the price of a unit of commodity X is P_X = €1 in the EMU and R = $1.20/€1, then P_X = $1.20 in the United States. The same is true for every other traded commodity and for all commodities together (price indices). That is,

$$P = RP^*$$

and

$$R = \frac{P}{P^*} \tag{15-1}$$

where R is the exchange rate of the dollar, P is the index of dollar prices in the United States, and P^* is the index of euro prices in the EMU.

We can show how the exchange rate between the dollar and the euro is determined according to the monetary approach by starting with the nominal demand-for-money function of the United States (M_d, from Equation (15-3)) and for the EMU (M^*_d):

$$M_d = kPY \text{ and } M^*_d = k^*P^*Y^*$$

where k is the desired ratio of nominal money balances to nominal national income in the United States, P is the price level in the United States, and Y is real output in the United States, while the asterisked symbols have the same meaning for the EMU.

In equilibrium, the quantity of money demanded is equal to the quantity of money supplied. That is, $M_d = M_s$ and $M^*_d = M^*_s$. Substituting M_s for M_d and M^*_s for M^*_d in Equation (15-3), and dividing the resulting EMU function by the U.S. function, we get

$$\frac{M_s^*}{M_s} = \frac{k^*P^*Y^*}{kPY} \tag{15-5}$$

By then dividing both sides of Equation (15-5) by P^*/P and M^*_s/M_s we get

$$\frac{P}{P^*} = \frac{M_s k^* Y^*}{M_s^* k Y} \tag{15-6}$$

CASE STUDY 15-4 Monetary Growth and Inflation

Table 15.2 gives the percentage growth of the money supply ($M1$) and consumer prices for the G-7 (leading industrial countries) over the periods 1973–1985, 1986–1998, and 1999–2011. Although prices depend on many other factors in the real world, according to the monetary approach, prices and money supplies should move together in the long run. From the table, we see that the percentage growth of the money supply and the inflation rate were very similar for the United States, Japan, France, and Italy in the first subperiod (1973–1985), and similar for the United States, France, and Italy in the second subperiod (1986–1998). The money supply varied greatly from the rate of inflation for all countries during the third and less inflationary subperiod (1999–2011).

TABLE 15.2. Money Supply and Consumer Prices, 1973–2011 (percentage increase)

	1973–1985	1986–1998	1999–2011	1973–2011
United States				
Growth of money supply	80.4	40.9	61.3	171.1
Inflation rate	83.0	39.2	27.6	134.4
Japan				
Growth of money supply	75.3	74.3	72.9	174.8
Inflation rate	74.0	15.2	−3.4	83.9
Germany*				
Growth of money supply	76.5	96.3	83.4	189.9
Inflation rate	50.3	26.4	22.4	93.9
United Kingdom				
Growth of money supply	92.2	100.9	79.9	185.4
Inflation rate	119.8	50.0	47.3	170.9
France*				
Growth of money supply	102.5	35.9	83.4	183.1
Inflation rate	107.1	27.4	23.1	142.9
Italy*				
Growth of money supply	146.1	51.5	65.1	185.0
Inflation rate	139.9	53.1	27.3	177.0
Canada				
Growth of money supply	106.2	76.0	97.2	209.3
Inflation rate	91.1	32.7	25.8	136.6
Average of all above countries				
Growth of money supply	97.0	68.0	80.2	188.1
Inflation rate	95.0	34.9	24.3	134.2

*The growth of the money supply reflects the growth in the supply of euros for 1999–2011.

Source: International Monetary Fund, *International Financial Statistics* (Washington, D.C.: IMF, various issues).

But since $R = P/P^*$ (from Equation (15-1)), we have

$$R = \frac{M_s k^* Y^*}{M_s^* k Y} \tag{15-7}$$

Since k^* and Y^* in the EMU and k and Y in the United States are assumed to be constant, R is constant as long as M_s and M^*_s remain unchanged. For example, if $k^*Y^*/kY = 0.3$ and $M_s/M^*_s = 4$, then $R = \$1.20/€1$. In addition, changes in R are proportional to changes in M_s and inversely proportional to changes in M^*_s. For example, if M_s increases by 10 percent in relation to M^*_s, R will increase (i.e., the dollar will depreciate) by 10 percent, and so on.

Several important things need to be noted with respect to Equation (15-7). First, it depends on the purchasing-power parity (PPP) theory and the law of one price (Equation (15-1)). Second, Equation (15-7) was derived from the demand for nominal money balances in the form of Equation (15-3), which does not include the interest rate. The relationship between interest rates and the exchange rate is examined in Section 15.3D, which deals with expectations. Third, the exchange rate adjusts to clear money markets in each country without any flow or change in reserves. Thus, for a small country (one that does not affect world prices by its trading), the PPP theory determines the price level under fixed exchange rates and the exchange rate under flexible rates. Case Study 15-4 shows the relationship between increases in the money supply and inflation rates (Equation (15-6)), while Case Study 15-5 shows the relationship between the nominal and the real exchange rate and provides a further test of the monetary approach under flexible exchange rates.

CASE STUDY 15-5 Nominal and Real Exchange Rates, and the Monetary Approach

Figure 15.4 shows the nominal and the real exchange rate index (with 1973 = 100) between the U.S. dollar ($) and the German mark (DM) from 1973 to 2011. The nominal exchange rate is defined as DM/$. (From the beginning of 1999, the fluctuation of the mark reflects the fluctuation of the euro with respect to the dollar.) The **real exchange rate** is the nominal exchange rate divided by the ratio of the consumer price index in Germany to the consumer price index in the United States. That is, (DM/$)/(PGerm/PUS) = (DM/$)(PUS/PGerm).

If the nominal exchange rate reflected changes in relative prices in the United States and Germany (as postulated by the PPP theory), then the real exchange rate should be the same as or remain in the same proportion to the nominal exchange rate. The figure shows, however, that while the nominal and real exchange rates did move together over time, they became increasingly different from 1973 to 1985, from 1995 to 2001, and in 2004–2006. Thus, this crucial element of the monetary approach (i.e., the PPP theory) did not seem to hold from 1973 to 1985, from 1995 to 2001, and in 2004–2006. From 1986 to 1994, 2002 to 2003, and 2007–2011, however, the nominal and real exchange rates (even as they remained widely different) did move pretty much together (see the figure).

(*continued*)

■ CASE STUDY 15-5 Continued

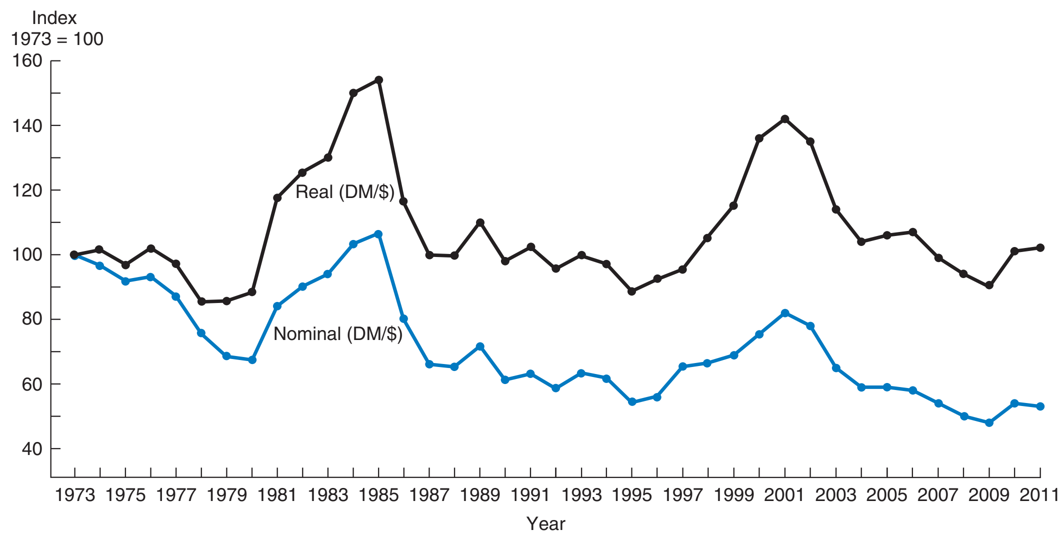

FIGURE 15.4. Nominal and Real Exchange Rate Indices between the Dollar and the Mark, 1973–2011. The figure shows the nominal and the real exchange rate indices (with 1973 = 100) between the dollar ($) and the German mark (DM) from 1973 to 2011. The nominal exchange rate is defined as DM/$. The real exchange rate is (DM/$)(PUS/PGerm). Since the nominal and real exchange rates became increasingly different from 1973 to 1985, 1995 to 2001, and 2004–2006, the PPP theory, as a crucial element of the monetary approach, did not seem to hold for these years. The two exchange rates did, however, move together from 1986 to 1994, 2002 to 2003, and 2007–2011.
Source: International Monetary Fund, *International Financial Statistics* (Washington, D.C.: IMF, various issues).

15.3D Expectations, Interest Differentials, and Exchange Rates

Exchange rates depend not only on the relative growth of the money supply and real income in various nations but also on inflation expectations and *expected* changes in exchange rates. If suddenly the rate of inflation is expected to be 10 percent higher in the United States than in the European Monetary Union than previously anticipated, the dollar will immediately depreciate by 10 percent with respect to the euro in order to keep prices equal in the United States and in the European Monetary Union, as required by the PPP theory and the law of one price. Thus, an increase in the expected rate of inflation in a nation leads to an immediate equal depreciation of the nation's currency.

An expected change in the exchange rate will also lead to an immediate actual change in the exchange rate by an equal percentage. To see why this is so, we go back to the theory of uncovered interest arbitrage (UIA) discussed in Section 14.6A. Since monetarists assume that domestic and foreign bonds are perfect substitutes (so that there is no additional risk in holding the foreign bond with respect to holding the domestic bond), the interest differential between two countries will always equal the expected change in the exchange rate between the two currencies. That is,

$$i - i^* = EA \qquad (15\text{-}8)$$

where i is the interest rate in the home country (say, the United States), i^* is the interest rate in the foreign country (say, the European Monetary Union), and EA is the expected percentage appreciation per year of the foreign currency (the €) with respect to the home country's currency (the $).

For example, if $i = 6\%$ and $i^* = 5\%$, then the expectation must be that the euro will appreciate by 1 percent at an annual basis in order to make the returns on investing in the European Monetary Union equal to the return on investing in the United States and thus be at *uncovered interest parity*. That is, the one percentage point per year by which the interest rate is lower in the European Monetary Union than in the United States is just made up by the one percentage point expected appreciation of the euro at an annual basis, thus equalizing the returns on U.S. and EMU investments, as required by uncovered interest parity.

If, for whatever reason, the expected appreciation of the euro (depreciation of the dollar) increased from 1 percent to 2 percent at an annual basis, this would make the return on investing in the European Monetary Union 7 percent per year (5 percent in interest and 2 percent from the expected appreciation of the euro at an annual basis) as compared to 6 percent return on the U.S. investment. This would lead to an immediate capital outflow from the United States to the European Monetary Union and actual appreciation of the euro by 1 percent per year, so as to go back to the expectation that the euro will appreciate by only 1 percent per year in the future and to uncovered interest parity. The foregoing conclusion assumes that the interest differential in favor of the United States remains at 2 percent per year. If the interest differential changes, then the new expected appreciation of the euro will also be different, but it will always have to equal, at an annual basis, the interest differential so as to satisfy the uncovered interest arbitrage condition given by Equation (15-8).

If $i < i^*$ so that returns on investments are lower in the United States than in the European Monetary Union, then the euro will be expected to depreciate (and the dollar to appreciate) by the specific percentage per year required for the condition of uncovered interest parity to hold. Furthermore, any change in the expected depreciation of the euro (appreciation of the dollar) will have to be matched by an equal actual depreciation of the euro (appreciation of the dollar), at an annual basis, so as to satisfy the condition for uncovered interest parity. Like the purchasing-power parity (PPP) theory and the law of one price, the uncovered interest arbitrage condition is an integral part of the monetary approach and exchange rate determination. Case Study 15-6 provides an empirical test of the uncovered interest arbitrage condition.

CASE STUDY 15-6 Interest Differentials, Exchange Rates, and the Monetary Approach

Figure 15.5 shows the nominal exchange rate index between the U.S. dollar and the German mark (defined as DM/$, as in Figure 15.4) and the nominal interest rate differential between the United States and Germany from 1973 to 2011. The nominal interest rate differential (in percentage points) is defined as the U.S. treasury bill rate minus the German treasury bill rate. According to the monetary approach, an increase in the U.S. interest rate relative to the interest rate in Germany should lead to a depreciation of the dollar relative to the mark, while a decrease in the interest differential in favor of the United States should lead to an appreciation of the dollar (i.e., the two curves should move in opposite directions). The figure shows that this is true in 24 years of the 38-year period (1973–1982, 1985, 1987–1989, 1991, 1994–1995, 1998, 2000–2003, 2005–2006, 2008).

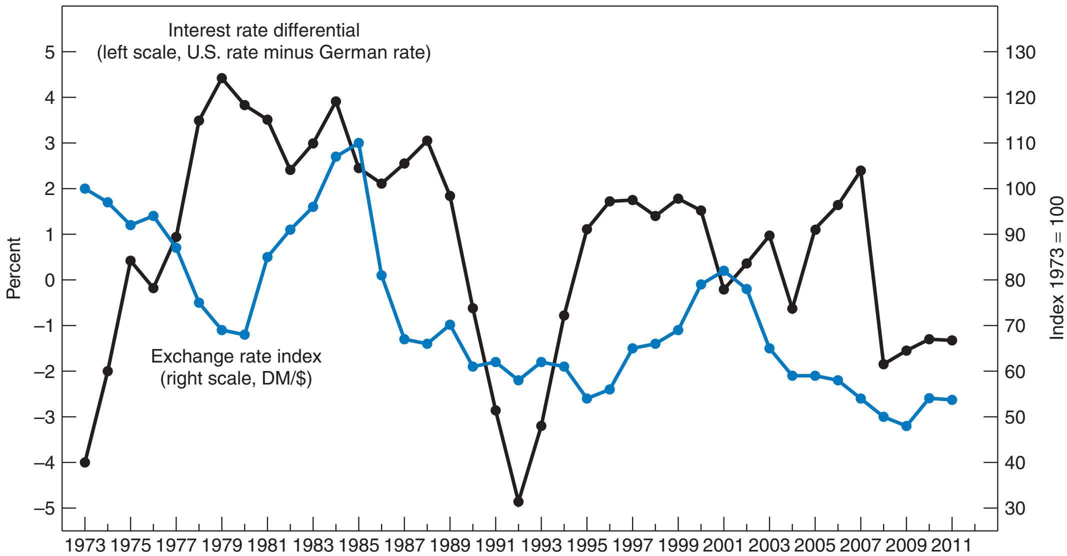

FIGURE 15.5. Nominal Interest Rate Differentials and Exchange Rate Movements, 1973–2011.
As predicted by the monetary approach, the U.S. dollar depreciated with respect to the German mark (the euro since 1999) when interest rates rose in the United States relative to Germany's (the two curves moved in opposite directions) in 24 out of the 38 years of the period examined.
Source: International Monetary Fund, *International Financial Statistics* (Washington, D.C.: IMF, various issues).

15.4 Portfolio Balance Model and Exchange Rates

In this section, we present the portfolio balance approach to the balance of payments and exchange rate determination. Section 15.4A shows a simple portfolio balance model. Section 15.4B presents an extended portfolio balance model that also includes expected exchange rate changes and risk. Section 15.4C then utilizes the model to examine portfolio adjustments.

15.4A Portfolio Balance Model

Until now, we have presented the monetary approach and have concentrated on the domestic demand for and supply of money. We have seen that when the quantity supplied of domestic money exceeds the quantity demanded by the nation's residents, there will be an outflow of domestic money (a deficit in the nation's balance of payments) under a fixed exchange rate system or a depreciation of the nation's currency under flexible exchange rates. On the other hand, when the quantity demanded of domestic money by the nation's residents exceeds the quantity supplied, there will be a capital inflow (a balance-of-payments surplus) under fixed exchange rates or an appreciation of the domestic currency under flexible rates. The monetary approach assumes that domestic and foreign bonds are perfect substitutes.

The portfolio balance approach (also called the *asset market approach*) differs from the monetary approach in that domestic and foreign bonds are assumed to be *imperfect substitutes*, and by postulating that the exchange rate is determined in the process of equilibrating or balancing the *stock* or total demand and supply of financial assets (of which money is only one) in each country. Thus, the portfolio balance approach can be regarded as a more realistic and satisfactory version of the monetary approach. The portfolio balance approach was developed since the mid-1970s, and many variants of the basic model have been introduced.

In the simplest asset market model, individuals and firms hold their financial wealth in some combination of domestic money, a domestic bond, and a foreign bond denominated in the foreign currency. The incentive to hold bonds (domestic and foreign) results from the yield or interest that they provide. However, they also carry the risk of default and the risk arising from the variability of their market value over time. Domestic and foreign bonds are not perfect substitutes, and foreign bonds pose some additional risk with respect to domestic bonds. Holding domestic money, on the other hand, is riskless but provides no yield or interest.

Thus, the opportunity cost of holding domestic money is the yield forgone on holding bonds. The higher the yield or interest on bonds, the smaller is the quantity of money that individuals and firms will want to hold. At any particular point in time, an individual will want to hold part of his or her financial wealth in money and part in bonds, depending on his or her particular set of preferences and degree of risk aversion. Individuals and firms *do* want to hold a portion of their wealth in the form of money (rather than bonds) in order to make business payments (the transaction demand for money). But the higher the interest on bonds, the smaller is the amount of money that they will want to hold (i.e., they will economize on the use of money).

The choice, however, is not only between holding domestic money, on the one hand, and bonds in general, on the other, but among holding domestic money, the domestic bond, and the foreign bond. The foreign bond denominated in the foreign currency carries the additional risk that the foreign currency may depreciate, thereby imposing a capital loss in terms of the holder's domestic currency. But holding foreign bonds also allows the individual to spread his or her risks because disturbances that lower returns in one country are not likely to occur at the same time in other countries (see Section 12.3A). Thus, a financial portfolio is likely to hold domestic money (to carry out business transactions), the domestic bond (for the return it yields), and the foreign bond (for the return and for the spreading of risks it provides). Given the holder's tastes and preferences, his or her wealth, the level of domestic and foreign interest rates, his or her expectations as to the future value of the foreign currency, rates of inflation at home and abroad, and so on, he or she will choose the portfolio that maximizes his or her satisfaction (i.e., that best fits his or her tastes).

A change in any of the underlying factors (i.e., the holder's preferences, his or her wealth, domestic and foreign interest rates, expectations, and so on) will prompt the holder to reshuffle his or her portfolio until he or she achieves the new desired (equilibrium) portfolio. For example, an increase in the domestic interest rate raises the demand for the domestic bond but reduces the demand for money and the foreign bond. As investors sell the foreign bond and exchange the foreign currency for the domestic currency in order to acquire more of the domestic bond, the exchange rate falls (i.e., the domestic currency appreciates with respect to the foreign currency). On the other hand, an increase in the foreign interest rate raises the demand for the foreign bond but reduces the demand for money and the domestic bond. As investors buy the foreign currency in order to acquire more of the foreign bond, the exchange rate rises (i.e., the domestic currency depreciates). Finally, an increase in wealth increases the demand for money, for the domestic bond, and for the foreign bond. But as investors buy the foreign currency to acquire more of the foreign bond, the exchange rate also rises (i.e., the domestic currency depreciates).

According to the portfolio balance approach, equilibrium in each financial market occurs when the quantity demanded of each financial asset equals its supply. It is because investors hold diversified and balanced (from their individual point of view) portfolios of financial assets that this model is called the portfolio balance approach. If investors demand more of the foreign bond either because the foreign interest rate rose relative to the domestic interest rate or because their wealth increased, the demand for the foreign currency increases and this causes an increase in the exchange rate (i.e., depreciation of the domestic currency). On the other hand, if investors sell foreign bonds either because of a reduction in the interest rate abroad relative to the domestic interest rate or because of a reduction in their wealth, the supply of the foreign currency increases and this causes a decrease in the exchange rate (i.e., appreciation of the domestic currency). Thus, we see that the exchange rate is determined in the process of reaching equilibrium in each financial market. A more formal presentation of this portfolio balance approach and exchange rate determination is presented in Section A15.2 of the appendix.

15.4B Extended Portfolio Balance Model

In this section, we extend the simple portfolio balance model just presented by specifying a more complete set of variables that determines the demand for money *(M)*, the demand for the domestic bond *(D)*, and the demand for the foreign bond *(F)* of residents of the home country. From our simple portfolio balance model presented previously we already know that *M, D*, and *F* depend on the domestic and the foreign interest rates (i and i^*). The additional variables on which *M, D*, and *F* depend that are now introduced are the expected change in the spot rate (in the form of the expected appreciation of the foreign currency or *EA*), the risk premium *(RP)* required to compensate domestic residents for the additional risk involved in holding the foreign bond, the level of real income or output *(Y)*, the domestic price level *(P)*, and the wealth *(W)* of the nation's residents.

We know from the uncovered interest parity condition (Equation (15-8)) discussed in Section 15.3C in connection with the monetary approach that

$$i - i^* = EA \qquad (15\text{-}8)$$

That is, the positive interest differential in favor of the home country (the United States) over the foreign country (the EMU) is equal to the expected appreciation (expressed on an annual percentage basis) of the foreign currency (€) in relation to the home-country currency ($). *EA* is now also included as an additional explanatory variable in the demand function for *M, D*, and *F* in the asset market model.

In addition, since the domestic and the foreign bond are now assumed to be imperfect substitutes, there is an extra risk in holding the foreign bond with respect to holding the domestic bond. This extra risk arises from *unexpected* changes in the exchange rate (currency risks) and/or limitations that foreign nations might impose on transferring earnings back home (country risks). The uncovered interest parity condition of Equation (15-8) must, therefore, be extended to include the risk premium *(RP)* that is required to compensate home-country residents for the extra risk involved in holding the foreign bond.

Thus, the condition for uncovered interest parity becomes

$$i - i^* = EA - RP$$

so that

$$i = i^* + EA - RP \tag{15-9}$$

Equation (15-9) postulates that the interest rate in the home country (i) must be equal to the interest rate in the foreign country (i^*) plus the expected appreciation of the foreign currency (*EA*) minus the risk premium on holding the foreign bond *(RP)*.

For example, if $i = 4\%$, $i^* = 5\%$, and $EA = 1\%$, then *RP* on the foreign bond must equal 2 percent in order to be at uncovered interest parity (i.e., $4\% = 5\% + 1\% - 2\%$). If the *RP* were only 1 percent, it would pay for home-country residents to buy more foreign bonds until the interest parity condition is satisfied, as explained in the next section. Of course, if the domestic bond is more risky than the foreign bond, *RP* is entered with a positive sign in Equation (15-9).

The extended portfolio balance model also includes the real income or output of the nation (GDP), the price level *(P)*, and the wealth *(W)* of the nation, as in the monetary approach. The extended demand functions for *M, D*, and *F* are thus given by Equations (15-10) to (15-12), with the sign on top of each variable referring to the postulated direct (+) or inverse (−) relationship between the independent or explanatory variables shown on the right-hand side of each equation and the dependent or left-hand variable in each equation.

$$M = f(\overset{-}{i}, \overset{-}{i^*}, \overset{-}{EA}, \overset{+}{RP}, \overset{+}{Y}, \overset{+}{P}, \overset{+}{W}) \tag{15-10}$$

$$D = f(\overset{+}{i}, \overset{-}{i^*}, \overset{-}{EA}, \overset{+}{RP}, \overset{-}{Y}, \overset{-}{P}, \overset{+}{W}) \tag{15-11}$$

$$F = f(\overset{-}{i}, \overset{+}{i^*}, \overset{+}{EA}, \overset{-}{RP}, \overset{-}{Y}, \overset{-}{P}, \overset{+}{W}) \tag{15-12}$$

Equation (15-10) postulates that the demand for (domestic) money by home-country residents (M) is inversely related to the interest rate in the home country *(i)*, the interest rate in the foreign country *(i^*)*, and the expected appreciation of the foreign currency *(EA)*. That is, the higher i, i^*, and *EA*, the lower will be M. Higher domestic or foreign interest rates increase the opportunity cost of holding money balances, and so home-country residents will demand a smaller quantity of money. Similarly, the greater the expected appreciation of the foreign currency, the greater the opportunity cost of holding money (since the expected return on the foreign bond, which is denominated in foreign currency, increases), and so M is also inversely related to EA. On the other hand, M is directly related to the risk premium required by home-country residents on holding the foreign bond (RP), the home-country real income (Y), prices (P), and wealth (W). That is, the greater the risk premium is on the foreign bond and the greater the real income, prices, and wealth are in the nation, the greater the demand is for money balances by the nation's residents.

Equation (15-11) postulates that the demand for the domestic bond (D) is directly related to i, RP, and W. That is, the greater the return on the domestic bond, the greater the demand for it. Similarly, the greater the risk premium on foreign bonds, the more home-country residents will hold domestic instead of foreign bonds. Furthermore, the greater the wealth of home-country residents, the more of the domestic and foreign bonds as well as money balances they will want to hold. On the other hand, D is inversely related to i^*, EA, Y, and P. That is, the higher i^* is, the more of the foreign instead of the domestic bond home-country residents will want to hold. Similarly, the higher Y and P are, the more home-country residents demand money balances instead of D and F. Finally, the greater the wealth of home-country residents is, the higher M, D, and F are.

Equation (15-12) postulates that F is inversely related to i, RP, Y, and P and positively related to i^*, EA, and W. That is, the higher i is, the less home-country residents will want to hold the foreign bond. A higher risk premium on the foreign bond will lead home-country residents to demand less of the foreign bond. A higher Y and P will lead home-country residents to demand more money balances and less of the foreign (and the domestic) bond. On the other hand, home-country residents will demand more of the foreign bond, the higher is the interest on the foreign bond, the greater the expected appreciation of the foreign currency, and the greater their wealth.

Setting the demand for money balances (M), the domestic bond (D), and the foreign bond (F) equal to their respective supplies, which are assumed to be exogenous (i.e., determined outside the model), we get the equilibrium quantity of money balances, domestic bonds, and foreign bonds, as well as the equilibrium rates of interest in the home and in the foreign nations, and the exchange rate between their currencies. All of these equilibrium values are obtained simultaneously. Furthermore, since all three assets (domestic money, domestic bonds, and foreign bonds) are substitutes for one another, any change in the value of any of the variables of the model will affect every other variable of the model. For example, any switch to or from money balances and/or domestic bonds into or from foreign bonds affects the exchange rate because they involve an exchange of currencies.

15.4c Portfolio Adjustments and Exchange Rates

In this section, we examine some portfolio adjustments to show how the extended portfolio balance model operates. Suppose that the home nation's monetary authorities engage in open market sales of government securities (bonds). This reduces the money supply (as people pay for the bonds with money balances), depresses the bond price, and increases the interest rate in the nation (i). The rise in i leads to a reduction in M and F and an increase in D (see the sign of i in Equations (15-10) to (15-12)). That is, domestic residents buy more of the domestic bond at the expense of domestic money balances and the foreign bond. Foreign residents (whose demand functions were not shown in the preceding model) also buy more of the nation's bond at the expense of their own bond and currency. The reduced demand for the foreign bond lowers its price and increases the foreign interest rate *(i^*)*. The inflow of funds to the home country also moderates the increase in the interest rate in the nation *(i)*. Furthermore, the sale of the foreign bond *(F)* and the purchase of the domestic bond *(D)* by domestic and foreign residents involve the sale of the foreign currency and purchase of the domestic currency, thus leading to an appreciation of the domestic currency and depreciation of the foreign currency under flexible exchange rates (a balance-of-payments surplus for the nation under fixed exchange rates).

The increase in i and i^*, as well as the appreciation of the domestic currency (depreciation of the foreign currency), may also lead to a larger expected future appreciation of the foreign currency *(EA)* and reduction in the risk premium on holding the foreign bond *(RP)*, now that less of the foreign bond is held. In the end, however, when equilibrium is reestablished in all markets simultaneously, the uncovered interest parity condition (Equation (15-9)) will once again have to hold. The level of real GDP, prices, and wealth in the nation (i.e., Y, P, and W) and abroad (Y^*, P^*, and W^*) are also likely to be affected by the change in i, i^*, *EA*, and *RD*, and these, in turn, will have further repercussions on all the other variables of the model. As we can see, tracing all the effects and repercussions of the original increase in the domestic interest rate can be extremely complicated. In the real world, the final equilibrium value of each variable of the model is usually obtained through computer simulations of the models of the domestic economy and the rest of the world. The usefulness of the model for us now is that it shows the relationship among all of the variables of the model and forces us to take an overall or comprehensive view of the economy as a whole in determining equilibrium exchange rates.

As another example of an exogenous change, suppose that the foreign currency is expected to appreciate *(EA)* more than previously believed in the future. The primary effect of this is to reduce M and D and increase F (see the sign of *EA* in Equations (15-10) to (15-12)). The reduction in M and D tends to reduce the interest rate in the nation *(i)*, but the outflow of funds resulting from domestic residents purchasing more of the foreign bond moderates the reduction of i and reduces i^* (the foreign interest rate). The increase in F by domestic residents also increases the demand for the foreign currency and leads to an appreciation of the foreign currency (depreciation of the domestic currency), which moderates the expected appreciation of the foreign currency *(EA)*. These changes are likely to affect the other variables and equations of the model for both domestic and foreign residents in the process of returning to equilibrium in all markets simultaneously. If instead of an increase in *EA* we had started with an increase in the risk premium *(RP)*, the effects would have been the opposite of those discussed earlier (see the sign of the *RP* variable in Equations (15-10) to (15-12)).

Finally, consider the effect of an autonomous increase in the real income or GDP *(Y)* in the nation. From Equations (15-10) to (15-12), we see that the immediate effect of this would be to increase M and reduce D and F. The reduction in F will lead to an appreciation of the domestic currency (depreciation of the foreign currency) under flexible exchange rates or a balance-of-payments surplus for the nation under fixed exchange rates. These changes, in turn, will have further effects on all the other variables of the model until equilibrium is reestablished in all markets simultaneously. Once equilibrium is reestablished, the exchange rate will stop changing and/or the balance-of-payments disequilibrium will be eliminated. That is, according to the portfolio balance approach, an exogenous change in any of the variables of the model will bring about only temporary changes in exchange rates or in balance-of-payments disequilibria. Exchange rate changes or balance-of-payments disequilibria over long periods of time can only mean that either adjustments to disequilibria are very slow or that continuous exogenous changes are taking place.

15.5 Exchange Rate Dynamics

In this section, we examine exchange rate dynamics, or the change in the exchange rate over time as it moves toward a new equilibrium level after an exogenous change. We will examine exchange rate dynamics at an intuitive level in Section 15.5A and more formally with a figure in Section 15.5B.

15.5A Exchange Rate Overshooting

We have seen previously that changes in interest rates, expectations, wealth, and so on disturb equilibrium and lead investors to reallocate financial assets to achieve a new equilibrium or balanced portfolio. The adjustment involves a change in the *stock* of the various financial assets in the portfolio. Having been accumulated over a long period of time, the total *stock* of financial assets in investors' portfolios in the economy is very large in relation to the yearly *flows* (additions to the stock) through usual savings and investments. Not only is the total stock of financial assets in investors' portfolios very large at any point in time, but any changes in interest rates, expectations, or other forces that affect the benefits and costs of holding the various financial assets are likely to lead to an immediate or very rapid change in their stock as investors attempt to quickly reestablish equilibrium in their portfolios.

For example, an unanticipated increase in the nation's money supply leads to an immediate decline in the nation's interest rate. If all markets were originally in equilibrium, the decline in the nation's interest rate would lead investors to shift from domestic bonds to money balances and foreign bonds, as explained earlier. This stock adjustment can be very large and usually occurs immediately or over a very short time. This is to be contrasted to a change in the *flow* of merchandise trade that results from, say, a depreciation of the nation's currency and that takes place only gradually and over a longer period of time. (Previous contracts have to be honored, and new orders may take many months to fill.) Thus, *stock* adjustments in financial assets are usually much larger and quicker to occur than adjustments in trade *flows*.

The differences in the size and quickness of stock adjustments in financial assets as opposed to adjustments in trade flows have very important implications for the process by which exchange rates are determined and change (their dynamics) over time. For example, an unexpected increase in the nations' money supply and decline in domestic interest rates are likely to lead to a large and quick increase in the demand for the foreign currency as investors increase their stock of the foreign bond. This, in turn, leads to an immediate and large depreciation of the domestic currency, which is likely to swamp the smaller and more gradual changes in exchange rates resulting from changes in real markets, such as changes in trade flows. (Of course, the opposite would occur if the money supply increased and the interest rate declined abroad.) To be sure, in the long run, the effect on exchange rates of changes in real markets will prevail, but in the short or very short run (i.e., during the period of a day, week, or month), changes in exchange rates are likely to reflect mostly the effect of stock adjustments in financial assets and expectations. If the real sector responded immediately, as financial sectors do, there would be no exchange rate overshooting.

The preceding analysis can also help explain why, in the short run, exchange rates tend to overshoot or bypass their long-run equilibrium level as they move toward long-run equilibrium. Since adjustments in trade flows occur only gradually over time, most of the burden of adjustment in exchange rates must come from financial markets in the very short and short runs. Thus, the exchange rate must overshoot or bypass its long-run equilibrium level for equilibrium to be quickly reestablished in financial markets. Over time, as the cumulative contribution to adjustment coming from the real (e.g., trade) sector is felt, the exchange rate reverses its movement and the overshooting is eliminated. Exactly how this takes place is shown next.

15.5B Time Path to a New Equilibrium Exchange Rate

The model that examines the precise sequence of events that leads the exchange rate in the short run to overshoot its long-run equilibrium was introduced by *Rudi Dornbusch* in 1976 and can be visualized with Figure 15.6. Panel (a) shows that at time t_0 the Fed unexpectedly increases the U.S. money supply by 10 percent, from \$100 billion to \$110 billion, and keeps it at that higher level. Panel (b) shows that the 10 percent unanticipated increase in the U.S. money supply leads to an immediate decline in the U.S. interest rate—say, from 10 percent to 9 percent at time t_0. Panel (c) shows that the 10 percent increase in the U.S. money supply will have no immediate effect on U.S. prices. We assume that U.S. prices are "sticky" and rise only gradually over time until they are 10 percent higher than originally in the long run (from the price index of 100 to 110).

Finally, panel (d) shows that as investors shift from domestic bonds and money balances to foreign bonds and increase their demand of the foreign currency (to purchase more foreign bonds), the exchange rate *(R)* increases (i.e., the dollar depreciates). The dollar *immediately* depreciates by more than the 10 percent that is expected *in the long run* (because of the 10 percent increase in the domestic money supply). Panel (d) shows that R immediately rises (the dollar depreciates) by 16 percent, from \$1/€1 to \$1.16/€1 at time t_0. The question is why does the dollar immediately depreciate by more than 10 percent when, according to the PPP theory, we expect it to depreciate only by 10 percent (the same percentage by which the U.S. money supply has increased) in the long run?

To explain this we must go back to the uncovered interest parity (UIP) condition given by Equation (15-8). This postulates that the domestic interest rate (i) is equal to the foreign interest rate *(i^*)* plus the expected appreciation of the foreign currency *(EA)*. Since we assume (as in the monetary approach) that domestic and foreign bonds are perfect substitutes, there is no risk premium. If we further assume for simplicity that *EA* equals zero, then the uncovered interest parity condition means that $i = i^*$ before the increase in the U.S. money supply. But the unanticipated increase in the U.S. money supply leads to a reduction in the U.S. interest rate. Thus, the U.S. interest rate *(i)* now exceeds the foreign interest rate *(i^*)*, and this must be balanced by the expectation of a future *depreciation* of the foreign currency (€) and appreciation of the dollar in order for the condition of uncovered interest parity to be once again satisfied.

The only way that we can expect the dollar to *appreciate* in the future and still end up with a net depreciation of 10 percent in the long run (to match the 10 percent increase in

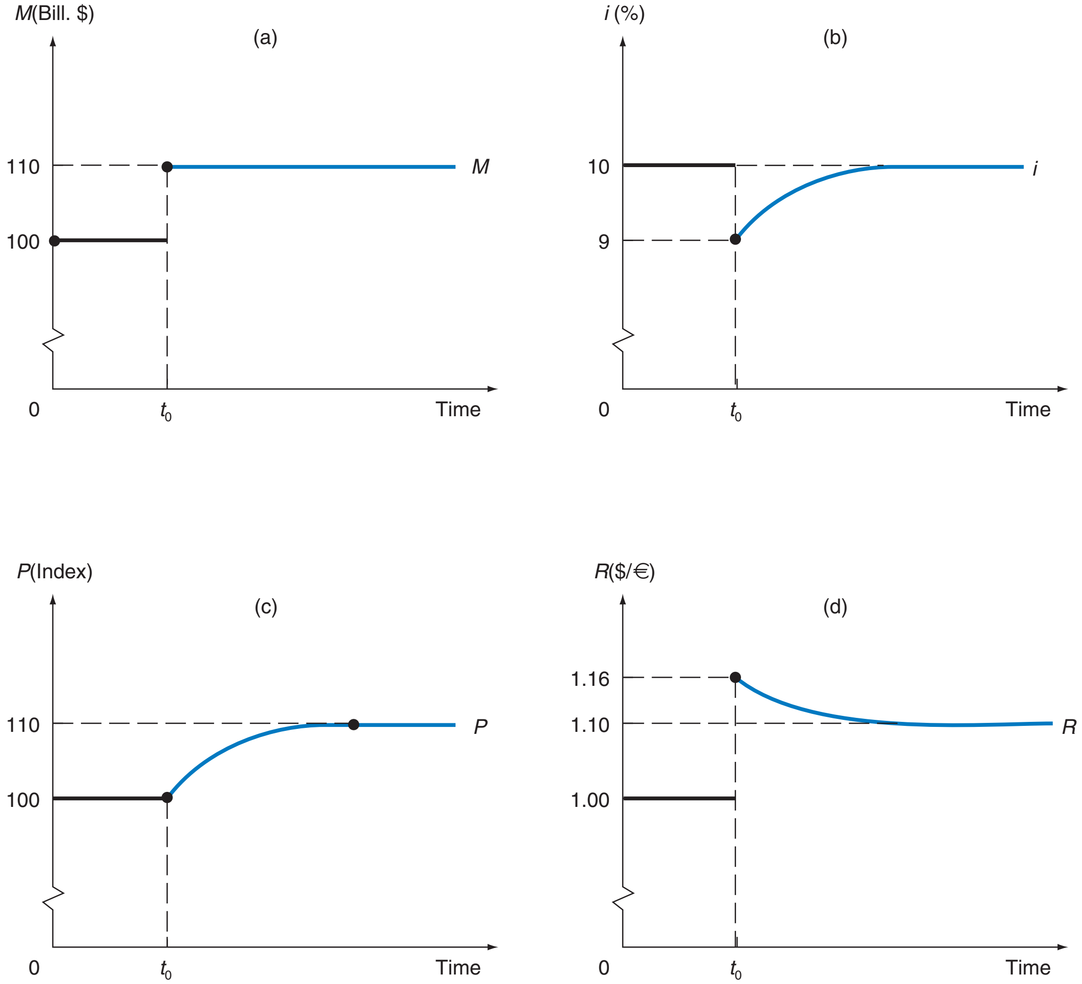

FIGURE 15.6. Exchange Rate Overshooting.
Panel (a) shows that the U.S. money supply unexpectedly increases by 10 percent from $100 to $110 billion at time t_0. In panel (b) the increase in the U.S. money supply immediately leads to a decline in the U.S. interest rate from 10 percent to 9 percent. Panel (c) shows that the U.S. price index rises by 10 percent from 100 to 110 only gradually over the long run. Panel (d) shows that the exchange rate of the dollar (R) immediately rises (the dollar depreciates) by 16 percent, from $1/€1 to $1.16/€1, thus overshooting its long-run equilibrium level of $1.10/€1, toward which it will then gradually move by appreciating (R falling) in the long run. As U.S. prices rise, the U.S. interest rate also gradually rises back to its original level of 10 percent in the long run.

the U.S. money supply and prices) is for the dollar to immediately depreciate by more than 10 percent. Panel (d) shows that the dollar immediately depreciates (R rises) by 16 percent at time t_0 and then gradually appreciates (R falls) by 6 percent (measured from the original base of $1.00) over time (thus removing the overshooting), so as to end up with a net depreciation of only 10 percent in the long run. In other words, after the initial excessive depreciation, the dollar appreciates in order to eliminate its undervaluation. Note also from panel (b) that over time, as U.S. prices rise by 10 percent, the U.S. nominal interest will also gradually rise until it reaches its original level of 10 percent in the long run.

It may seem to be a contradiction that the dollar appreciates by 6 percent over time (after its sudden 16 percent depreciation at time t_0) at the same time that prices are rising in the United States. But, as shown in panel (d), the dollar appreciation occurs only to remove the excessive depreciation at time t_0. Another way to look at this, which also brings trade into the picture, is to realize that the immediate depreciation of the dollar will lead to a gradual increase in the nation's exports and reduction in the nation's imports, which will result (everything else being equal) in an *appreciation* of the dollar over time. Since we know from the PPP theory that the dollar must depreciate by 10 percent in the long run, the only way to also expect that the dollar will appreciate in the future is for the dollar to immediately depreciate by more than 10 percent as a result of the unexpected 10 percent increase in the U.S. money supply.

Of course, if other disturbances occur before the exchange rate reaches its long-run equilibrium level, the exchange rate will be continually fluctuating, always moving toward its long-run equilibrium level but never quite reaching it. This seems to conform well with the recent real-world experience with exchange rates. Specifically, since 1971, and especially since 1973, exchange rates have been characterized by a great deal of volatility, overshooting, and subsequent correction, but always fluctuating in value (see Case Study 15-7).

15.6 Empirical Tests of the Monetary and Portfolio Balance Models and Exchange Rate Forecasting

In an influential paper *Frenkel* (1976) presented strong evidence in support of the monetary model during the German hyperinflation of the 1920s, and so did *Bilson* (1978) and *Dornbusch* (1979) for the inflationary period of the 1970s. From the late 1970s, however, empirical tests have rejected the monetary model. For example, *Frankel* (1993) showed that an increase in the German money supply led to an appreciation of the mark, rather than a depreciation, as predicted by the monetary model. Using more sophisticated estimating techniques, *MacDonald and Taylor* (1993), *MacDonald* (1999), and *Rapach and Wohar* (2002), however, did find some support for the monetary model (i.e., exchange rates do seem to converge toward their equilibrium level) in the long run.

Much less empirical work has been carried out on the portfolio balance model because of inadequate data, and the tests that have been conducted do not provide much empirical support for this model either. Two such tests were carried out by *Branson, Halttunen, and Masson* (1977) and *Frankel* (1984). *Frankel* estimated an equation for the exchange rate of the dollar with respect to the German mark, Japanese yen, French franc, and British pound for the 1973–1979 period and found that the effect (sign) of most of the explanatory variables of the model was the opposite of that postulated or predicted by the theory.

Another way of testing empirically the monetary and the portfolio balance models is to examine the ability of these models to accurately predict or forecast future exchange rates. In a landmark study, *Meese and Rogoff* (1983a) found that none of the exchange rate models outperforms the forecasting ability of the *forward rate* or the *random walk model*. The latter postulates that the best prediction or forecast of the exchange rate in the next period (say, in the next quarter) is given by the exchange rate in this quarter! Indeed, of the six tests conducted for the mark/dollar and the yen/dollar exchange rates, the random walk was the best predictor in four tests, the forward rate in two, and the monetary and asset market or portfolio balance models in none. Further work by the same authors (1983b), however,

CASE STUDY 15-7 Exchange Rate Overshooting of the U.S. Dollar

Figure 15.7 shows the volatility and overshooting of the U.S. dollar with respect to the Deutsche mark and the Japanese yen from 1961 to April 2012. The figure shows percentage changes from the previous month in units of the foreign currency per U.S. dollar. (Since the beginning of 1999, the fluctuation of the dollar/Deutsche mark exchange rate reflects the fluctuation of the euro with respect to the dollar.) Compare the small variation in the dollar exchange rates from 1961 to 1971 during the fixed exchange rate period with the wild fluctuations and overshooting since 1973 under the present flexible or managed exchange rate system.

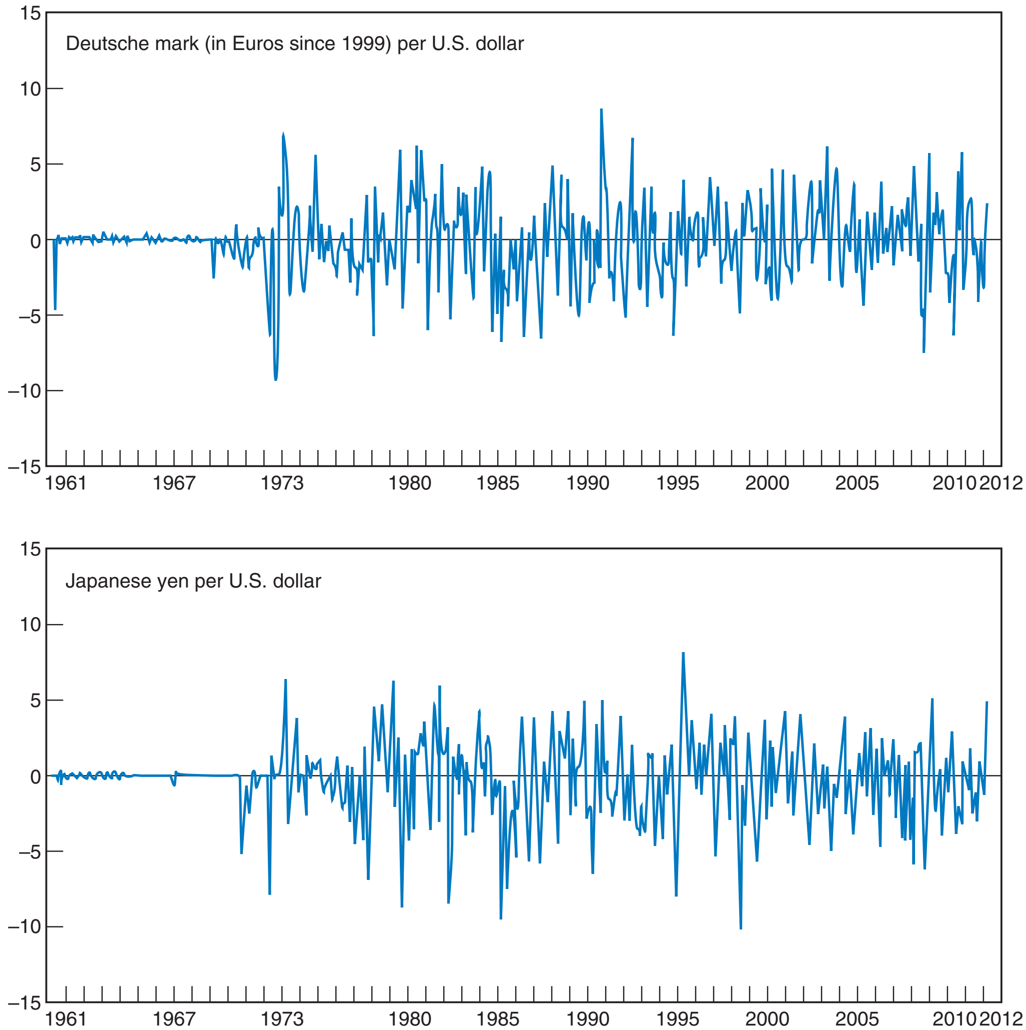

FIGURE 15.7. Overshooting of the Dollar Exchange Rates.
The wild fluctuations of the dollar exchange rate with respect to the Deutsche mark (DM) and the Japanese yen after 1973 are taken as an indication of exchange rate overshooting during the present managed exchange rate system. Since the beginning of 1999, the fluctuation of the DM/$ reflects the fluctuation of the euro with respect to the dollar.
Source: International Monetary Fund, *International Financial Statistics* (Washington, D.C.: IMF, various issues).

indicated that the monetary and asset market or portfolio balance models did outperform the simple random walk model for horizons beyond 12 months.

In a more recent study, *Mark* (1995) tested the monetary model used by *Meese and Rogoff* (1983), modified to include exchange rate overshooting, for the exchange rate of the U.S. dollar with respect to the Canadian dollar, mark, yen, and Swiss franc, for one-quarter, one-year, and three-year horizons, over the 1981–1991 period. *Mark* found that the modified model had the same size forecasting error as the simple random walk model for all four exchange rates for the one-quarter horizon. The modified model outperformed (i.e., it had a smaller forecasting error than) the random walk model for the dollar/yen and the dollar/Swiss franc exchange rates, but not for the other two exchange rates over a one-year horizon, and outperformed the random walk model for the three-year horizon for three of the four exchange rates (the only exception being the U.S. dollar/Canadian dollar exchange rate). Similar results were obtained by *Rapach and Wohar* (2002). *Frankel and Rose* (1995), *Lewis* (1995), *Rogoff* (1999), *Neely and Sarno* (2002), and *Engle and West* (2004), however, remain skeptical. In 2005, *Evans and Lyons* introduced a microbased model utilizing nonpublic information that seems to outperform the random walk and other models over horizons from one day to one month.

There are basically two reasons for the poor forecasting ability of our exchange rate models. First, exchange rates are strongly affected by new information or "news," which cannot be predicted (*Dornbusch*, 1980). Second, the expectations of exchange market participants often become self-reinforcing and self-fulfilling, at least for a while, thus leading to so-called *speculative bubbles*. That is, sometimes a movement of the exchange rate in a given direction leads to expectations that it will continue to move in the same direction regardless of the fundamentals. Eventually, however, the bubble will burst and the exchange rate movement will reverse itself, with the exchange rate overcompensating in the opposite direction and overshooting its long-run equilibrium level and subsequent large depreciation. An example of an exchange rate bubble was the sharp overvaluation of the dollar in the first half of the 1980s. Unpredictable news and bandwagon effects make exchange rates almost completely impossible to forecast over short (less than one-year) horizons. This was clearly the case for the euro/dollar exchange rate since its creation in January 1999 (see Case Study 15-8).

CASE STUDY 15-8 The Euro Exchange Rate Defies Forecasts

The euro (the currency of 17 of the 27 member countries of the European Union or EU—see Case Study 14-2) was introduced on January 1, 1999, at the value of $1.17; however, defying almost all predictions (that it would appreciate to between $1.25 to $1.30 by the end of the year), it declined almost continuously to the low of $0.82 at the end of October 2000 (see Figure 15.8). The euro then appreciated to $0.95 at the beginning of 2001, only to fall again to below $0.85 at the beginning of July 2001, despite higher interest rates in the European Monetary Union (EMU) or Eurozone, the recession in the United States, and the terrorist attacks on the World Trade Center in New York and the Pentagon in September 2001—again defying most experts' forecasts. Starting in February 2002, however, the euro appreciated almost continuously, reaching parity with the dollar in mid-2002, $1.36 at the end of 2004, the all-time high of $1.58 in July 2008, and it was $1.32 in March 2012. Only afterwards could experts "explain" the reasons for its movement.

(*continued*)

■ CASE STUDY 15-9 Continued

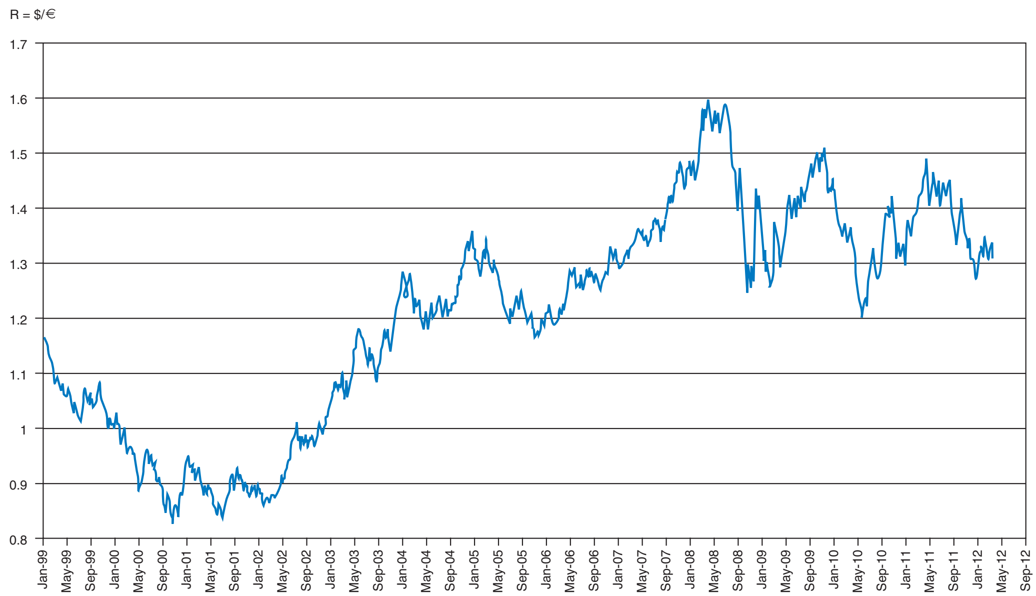

FIGURE 15.8. The Euro/U.S. Dollar Exchange Rate Since the Introduction of the Euro.
The euro depreciated almost continuously from the time of its introduction at the beginning of 1999 until October 2000 and remained below parity until the middle of 2002—defying most experts' forecasts. The euro reached the high of $1.36 in December 2004, $1.58 in July 2008, and it was $1.32 in March 2012.
Source: International Monetary Fund, *International Financial Statistics* (Washington, D.C., IMF, 2012).

More recently, *Engle*, *Mark, and West* (2007), *Wang and Wu* (2009), *Della Corte, Sarno, and Tsiakas* (2009), *Rime*, *Sarno, and Sojli* (2010), and *Evans* (2011) have shown that emphasizing the Taylor monetary rule and its effect on expectations seems to be able to account for some exchange rate volatility and reduce forecast intervals, but success in correctly forecasting exchange rates remains, for the most part, elusive.

Thus, we can conclude that in contrast to the exciting advances in the theoretical modeling of exchange rates, empirical results do not provide much support for these theories, except in the long run. This does not mean that these theories are wrong or that they are not useful. It simply means that they provide incomplete explanations of exchange rate determination. On an intuitive level, we do expect exchange rates to gravitate toward their PPP level in the long run, and we do expect uncovered interest arbitrage to hold when extended to include the expectation of exchange rate changes and risk premia. What is still needed, however, is better modeling of expectations and a greater synthesis and integration of monetary and real exchange rate theories. These topics are examined in Chapters 16 and 17.

SUMMARY

1. Modern exchange rate theories are based on the monetary and the asset market or portfolio balance approaches to the balance of payments and view the exchange rates, for the most part, as a purely financial phenomenon. Traditional exchange rate theories, on the other hand, are based on trade flows and contribute to the explanation of exchange rate movements in the long run. With financial flows now dwarfing trade flows, interest has shifted to modern exchange rate theories, but traditional theories remain important and complement modern theories in the long run.

2. The absolute purchasing-power parity (PPP) theory postulates that the exchange rate between two currencies is equal to the ratio of the price level in the two countries so that a given commodity has the same price in both countries when expressed in terms of the same currency (the law of one price). The more refined relative PPP theory postulates that the change in the exchange rate should be proportional to the change in relative prices in the two nations. The theory has relevance only in very long-run or in highly inflationary periods. The existence of nontraded goods and structural changes usually leads the theory astray. This has been particularly true since the late 1970s.

3. According to the monetary approach, the nominal demand for money is stable in the long run and positively related to the level of nominal national income but inversely related to the interest rate. The nation's money supply is equal to its monetary base times the money multiplier. The nation's monetary base is equal to the domestic credit created by its monetary authorities plus its international reserves. Unless satisfied domestically, an excess supply of money in the nation results in an outflow of reserves, or a balance-of-payments deficit under fixed exchange rates and a depreciation of the nation's currency (without any international flow of reserves) under flexible exchange rates. The opposite takes place with an excess demand for money in the nation. Thus, except for a currency-reserve country, such as the United States, the nation has no control over its money supply in the long run under fixed exchange rates but retains control under flexible exchange rates. An increase in the expected rate of inflation in a nation will immediately result in an equal percentage depreciation of the nation's currency. The monetary approach also assumes that the interest differential in favor of the home nation equals the expected percentage appreciation of the foreign country's currency (uncovered interest arbitrage).

4. In the portfolio balance model, individuals and firms hold their financial wealth in some combination of domestic money, a domestic bond, and a foreign bond denominated in the foreign currency. The incentive to hold bonds (domestic and foreign) results from the yield or interest that they provide. But they also carry the risk of default and variability of their market value over time. In addition, foreign bonds carry currency and country risks. Holding domestic money, on the other hand, is riskless but provides no yield or interest. The demand for money balances *(M)*, the domestic bond *(D)*, and the foreign bond *(F)* are functions of or depend on the interest rate at home and abroad *(i and i^*)*, the expected appreciation of the foreign currency *(EA)*, the risk premium on holding the foreign bond *(RP)*, as well as real GDP *(Y)*, prices *(P)*, and wealth *(W)* in the nation. Setting M, D, and F equal to their respective supplies, we get the equilibrium quantity of money balances, domestic bonds, and foreign bonds, as well as the equilibrium rates of interest in the home and in the foreign nations, and the exchange rate between their currencies. Any change in the value of any of the variables of the model will affect every other variable of the model. The exchange rate is determined in the process of reaching equilibrium in each financial market simultaneously.

5. Having been accumulated over a long period of time, the total stock of financial assets in investors' portfolios is very large. Any change in interest rates, expectations, or other forces that affect the benefits and costs of holding the various financial assets are likely to lead to an immediate or very rapid change in their stock as investors attempt to quickly reestablish equilibrium in their portfolios. Since adjustments in the real sector (trade flows) occur only gradually over time, most of the burden of adjustment in exchange rates must come from financial markets in the very short and short runs. Thus, the exchange rate must

overshoot or bypass its long-run equilibrium level for equilibrium to be quickly reestablished in financial markets. Over time, as the cumulative contribution to adjustment coming from the real (trade) sector is felt, the exchange rate reverses its movement and the overshooting is eliminated. Since underlying conditions in financial markets are in constant flux, exchange rates are very volatile.

6. Empirical tests do not provide much support for the monetary and the portfolio balance models, except in the long run. Short-run exchange rates have defied all attempts at accurate forecasting. One reason for this is the importance of news, which cannot be predicted. Another reason is the existence or development of speculative bubbles, which often move exchange rates away from fundamentals. This does not mean that these theories are wrong or that they are not useful. It simply means that they provide incomplete explanations of exchange rate determination.

A LOOK AHEAD

This chapter concludes Part Three, which deals with the balance of payments, foreign exchange markets, and exchange rate determination. Part Four examines the relationship between the external sector and the rest of the national economy, as well as the operation of the international monetary system. Part Four begins with Chapter 16, which discusses how the exchange rate affects the nation's current account and how trade flows help to determine exchange rates in the long run. Chapter 17 focuses on how international trade and the current account affect and are in turn affected by changes in the level of national income. Chapters 18 and 19 then deal with macroeconomic policies in open economies, and Chapters 20 and 21 look at the operation and future of the international monetary system.

KEY TERMS

Absolute purchasing-power parity theory, p. 464
Balassa–Samuelson effect, p. 465
Demand for money, p. 471
Exchange rate overshooting, p. 487
Expected change in the spot rate, p. 482
Law of one price, p. 464
Monetary approach to the balance of payments, p. 471
Monetary base, p. 472
Portfolio balance approach, p. 481
Purchasing-power parity (PPP) theory, p. 464
Real exchange rate, p. 477
Relative purchasing-power parity theory, p. 465
Risk premium (*RP*), p. 483
Supply of money, p. 471

QUESTIONS FOR REVIEW

1. Which are the modern and the traditional exchange rate theories? What distinguishes them? What is the relevance of each? What is the relationship between them?

2. What is the purchasing-power parity theory? What are its uses? What is the absolute purchasing-power parity theory? Why is this not acceptable?

3. What is the relative purchasing-power parity theory? Do empirical tests confirm or reject the relative purchasing-power parity theory?

4. What is demand for money according to the monetary approach to the balance of payments? What is the supply of money of the nation? What is meant by the monetary base of the nation? the money multiplier?

5. How does a deficit or a surplus in the nation's balance of payments arise according to the monetary approach? Why do nations lose control over their money supply in the long run under fixed exchange rates?

6. How does the monetary approach explain the process by which a balance-of-payments disequilibrium is corrected under a flexible exchange rate system? How does this differ from the case of fixed exchange rates?

7. What determines the value of the exchange rate and its change under a flexible exchange rate system according to the monetary approach? How does a managed floating exchange rate system compare with a flexible and fixed exchange rate system from the point of view of the monetary approach?

8. What is the role of expectations and uncovered interest arbitrage in the monetary approach to the balance of payments?

9. What is meant by the asset market or portfolio balance approach? In what ways does it differ from the monetary approach?

10. What is the relative importance of stock adjustments in financial assets as compared with adjustments in trade flows for exchange rate changes in the short run and in the long run according to the portfolio approach?

11. What is the role of expectations and the risk premium in the asset market or portfolio balance approach? Why was there no risk premium in the monetary approach?

12. How do the monetary and the asset market or portfolio balance approaches explain the over–shooting in exchange rates that is often observed in foreign exchange markets today?

13. Do empirical tests support or reject the monetary and portfolio approaches?

14. What additional theoretical and empirical work needs to be done? What is likely to be the outcome of this additional work in the foreseeable future?

PROBLEMS

1. In 1973, the GDP deflator was 15.6 in the United Kingdom and 34.3 in the United States (with 1995 = 100). In 2001, it was 116.1 in the United Kingdom and 112.1 in the United States. The exchange rate was £0.4078 to the dollar in 1973 and £0.6944 to the dollar in 1998.

   (a) Calculate the rate of inflation in the United Kingdom minus the rate of inflation in the United States from 1973 to 2001 and compare it with the rate of depreciation of the British pound with respect to the U.S. dollar over the same time period.

   (b) Did the relative purchasing-power parity (PPP) theory hold between the United Kingdom and the United States between 1973 and 2001? Why?

2. In 1973, the GDP deflator was 45.0 in Switzerland and 34.3 in the United States (with 1995 = 100). In 2001, it was 103.2 in Switzerland and 112.1 in the United States. The exchange rate of the Swiss franc was SF3.1648 per dollar in 1973 and SF1.6876 in 2001. Did the relative PPP theory hold between Switzerland and the United States between 1973 and 2001? Why?

3. Suppose that the velocity of circulation of money is $V = 5$ and the nominal GDP of the nation is $200 billion.

   (a) What is the quantity of money demanded by the nation?

   (b) By how much will the quantity of money demanded rise if the nation's nominal GDP rises to $220 billion?

   (c) What happens to the nation's demand for money if its nominal GDP increases by 10 percent each year?

4. Suppose that the domestic credit created by the nation's monetary authorities is $8 billion and the nation's international reserves are $2 billion, and that the legal reserve requirement for the nation's commercial banking system is 25 percent.

   (a) How much is the monetary base of the nation?

   (b) What is the value of the money multiplier?

(c) What is the value of the total supply of money of the nation?

5. Assuming fixed exchange rates, find the size of the deficit or surplus in the balance of payments of the nation described in

(a) Problems 3a and 4a.

(b) Problems 3b and 4b.

(c) Problems 3c and 4c.

6. Explain how the balance-of-payments disequilibrium is corrected if monetary authorities do not change the domestic component of the nation's monetary base:

(a) In Problem 5b.

(b) In Problem 5c.

(c) What happens if monetary authorities completely sterilize, or neutralize, the balance-of-payments disequilibrium with a change in the domestic component of the nation's monetary base? How long can this go on?

***7.** Suppose that a nation's nominal GDP $= 100$, $V = 4$, and $M_s = 30$. Explain why this nation has a deficit in its balance of payments.

8. Under the law of one price, the price of an internationally traded commodity in one nation in a two-nation world is equal to the exchange rate times the price of the same commodity in the other nation. Assuming that such a law holds, explain why, if the first nation would otherwise face no inflation at home, it will not be able to maintain in the long run both constant prices and a constant exchange rate in the face of inflation in the other nation.

***9.** Suppose that the interest rate is $i = 10\%$ in New York and $i^* = 6\%$ in Frankfurt, the spot rate is $SR =$ \$1/€1 today and is expected to be \$1.01/€1 in three months.

(a) Indicate why the condition for uncovered interest parity (UIP) is satisfied.

(b) Explain what would happen if there was a change in expectations so that the spot rate in three months became \$1.02/€ and the interest rate differential remained unchanged.

10. **(a)** What is the difference between the expected change in the exchange rate and the forward discount or forward premium on the foreign currency?

(b) When would the expected change in the exchange rate equal the forward discount or forward premium on the foreign currency?

11. Suppose that individuals and firms in a nation are holding the desired proportion of their wealth in foreign bonds to begin with. Suppose that there is then a once-and-for-all decrease in the exchange rate (i.e., the domestic currency appreciates and the foreign currency depreciates). What is the adjustment that the simple portfolio balance model presented in Section 15.4A postulates?

***12.** Discuss the portfolio adjustment for an increase in expected domestic inflation under flexible exchange rates using the extended or portfolio balance model presented in Section 15.4B.

13. Using the extended asset market or portfolio balance model presented in Section 15.4B examine the portfolio adjustment resulting from an increase in the supply of the foreign bond because of the foreign government budget deficit.

14. Explain the exchange rate dynamics of the dollar resulting from an unanticipated increase in the money supply by the EMU central bank.

*= Answer provided at www.wiley.com/college/salvatore.

APPENDIX

In this appendix we present a formal model of the monetary and portfolio balance approach to the balance of payments and the exchange rate.

A15.1 Formal Monetary Approach Model

This appendix presents a formal mathematical model of the monetary approach to the balance of payments, which summarizes the more descriptive analysis presented in the chapter.

We begin by assuming that the complete demand function for money takes the following form:

$$M_d = (P^a Y^b u)/(i^c) \tag{15A-1}$$

where M_d = quantity demanded of nominal money balances
P = domestic price level
Y = real income or output
i = interest rate
a = price elasticity of demand for money
b = income elasticity of demand for money
c = interest elasticity of demand for money
u = error term

Equation (15A-1) shows M_d to be directly related to PY, or GDP, and inversely related to i, as explained in Section 15.3A.

On the other hand, the nation's supply of money is assumed to be

$$M_s = m(D + F) \tag{15A-2}$$

where M_s = the nation's total money supply
m = money multiplier
D = domestic component of the nation's monetary base
F = international or foreign component of the nation's monetary base

The amount of D is determined by the nation's monetary authorities, and the sum $D + F$ represents the nation's total monetary base, or high-powered money.

In equilibrium, the quantity of money demanded is equal to the quantity of money supplied:

$$M_d = M_s \tag{15A-3}$$

Substituting Equation (15A-1) for M_d and Equation (15A-2) for M_s into Equation (15A-3), we get

$$(P^a Y^b u)/(i^c) = m(D + F) \tag{15A-4}$$

Taking the natural logarithm (ln) of both sides of Equation (15A-4), we have

$$a \ln P + b \ln Y + \ln u - c \ln i = \ln m + \ln(D + F) \tag{15A-5}$$

Differentiating Equation (15A-5) with respect to time (t), we get

$$\begin{aligned} a(1/P)(dp/dt) + b(1/Y)(dY/dt) + (1/u)(du/dt) - c(1/i)(di/dt) \\ = (1/m)(dm/dt) + [D/(D + F)](1/D)(dD/dt) \\ + [F/(D + F)](1/F)(dF/dt) \end{aligned} \tag{15A-6}$$

Simplifying the notation by letting $D + F = H$, $(1/P)(dP/dt) = gP$, $(1/Y)(dY/dt) =$ gY, and so on (where g is the rate of growth), we have

$$agP + bgY + gu - cgi = gm + (D/H)gD + (F/H)gF \tag{15A-7}$$

Rearranging Equation (15A-7) to make the last term on the right-hand side the dependent variable on the left-hand side, we get the general form of the equation usually used in empirical tests of the monetary approach to the balance of payments:

$$(F/H)gF - agP + bgY + gu - cgi - gm - (D/H)gD \tag{15A-8}$$

According to Equation (15A-8), the weighted growth rate of the nation's international reserves $[(F/H)gF]$ is equal to the *negative* weighted growth rate of the domestic component of the nation's monetary base $[(D/H)gD]$ if the rate of growth of prices, real income, interest rate, and money multiplier are all zero.

What this means is that, other things being equal, when the nation's monetary authorities change D, an equal and opposite change automatically occurs in F. Thus, the nation's monetary authorities can only determine the *composition* of the nation's monetary base (i.e., $H = D + F$) but not the size of the monetary base itself. That is, under fixed exchange rates, the nation has no control over its money supply and monetary policy.

On the other hand, growth in Y, with constant P, i, and m, must be met either by an increase in D or F or by a combination of both. If the nation's monetary authorities do not increase D, there will be an excess demand for money in the nation that will be satisfied by an inflow of money or reserves from abroad (a surplus in the nation's balance of payments) under fixed exchange rates. Equation (15A-8) can similarly be used to determine the effect of a change in any other variable included in the equation on the nation's balance of payments.

Empirical tests along the lines of Equation (15A-8) seem to lend only mixed and inconclusive support to the monetary approach to the balance of payments. However, more empirical tests are needed and more theoretical work is required to try to reconcile the monetary approach with the traditional approaches.

Problem Suppose that the values obtained by estimating Equation (15A-8) for a particular nation over a specified period of time are $a = b = c = 1$ and $gu = gi = gm = 0$. Suppose also that at the beginning of the period of the analysis, $D = 100$ and $F = 20$ in this nation and during the period of the analysis $gP = 10\%$ and $gY = 4\%$ and the nation's monetary authorities increase D from 100 to 110. Estimate the value of this nation's international reserves (F) at the end of the period under fixed exchange rates.

A15.2 Formal Portfolio Balance Model and Exchange Rates

In this section we present a simple one-country formal portfolio balance model in which individuals and firms hold their financial wealth in some combination of domestic money, a domestic bond, and a foreign bond denominated in the foreign currency.

The basic equations of the model can be written as follows:

$$M = a(i, i^*)W \tag{15A-9}$$

$$D = b(i, i^*)W \tag{15A-10}$$

$$RF = c(i, i^*)W \tag{15A-11}$$

$$W = M + D + RF \tag{15A-12}$$

where M is the quantity demanded of nominal money balances by domestic residents, D is the demand for the domestic bond, R is the exchange rate (defined as the domestic currency price of a unit of the foreign currency), RF is the demand for the foreign bond in terms of the domestic currency, W is wealth, i is the interest rate at home, and i^* is the interest rate abroad.

The first three equations postulate that the quantity demanded of domestic money balances, the domestic bond, and the foreign bond by the nation's residents are functions of, or depend on, the domestic interest rate and the foreign interest rate, and are equal to a particular proportion of wealth. The sum $a + b + c = 1$. That is, the total wealth of the nation *(W)* equals $M + D + RF$ (Equation (15A-12)).

Specifically, the foregoing model postulates that M, D, and RF are fixed proportions of W. In addition, M is inversely related to i and i^*. D is directly related to i and inversely related to i^*. RF is inversely related to i and directly related to i^*. An increase in i raises D but reduces M and RF. An increase in i^* raises RF but reduces M and D. Through savings, W increases over time, and an increase in W increases M, D, and F.

According to the portfolio balance approach, equilibrium in each financial market occurs only when the quantity demanded of each financial asset equals its supply. Assuming that each financial market is in equilibrium to begin with and solving for RF in Equation (15A-12), we get

$$RF = W - M - D \tag{15A-13}$$

Substituting Equation (15A-9) for M and Equation (15A-10) into Equation (15A-13), we get

$$\begin{aligned} RF &= W - a(i, i^*)W - b(i, i^*)W \\ RF &= (1 - a - b)W \end{aligned} \tag{15A-14}$$

Equation (15A-14) can be rewritten as

$$RF = (1 - a - b)W - f(i, i^*)W \tag{15A-15}$$

Thus,

$$R = f(i, i^*)W/F \tag{15A-16}$$

From Equation (15A-16) we can postulate that the exchange rate is directly related to i^* and W and inversely related to i and F. That is, an increase in wealth resulting from an increase in savings increases the demand for all three financial assets, but as the nation exchanges the domestic currency for the foreign currency to purchase more of the foreign bond, the exchange rate will rise (i.e., the domestic currency will depreciate). Similarly, when the interest rate rises abroad, domestic residents purchase more of the foreign bond and R rises. On the other hand, an increase in the supply of F will lower its price and reduce the wealth of domestic residents. When this occurs, they will reduce their holdings of all financial assets, including the foreign bond. But as foreign bonds (which are denominated in the foreign currency) are sold and the foreign currency exchanged for the domestic currency on the exchange market, the exchange rate falls (i.e., the domestic currency appreciates). The same is true if the domestic interest rate rises.

Problem Using the portfolio balance model presented earlier, examine the effect on the exchange rate of (a) an increase in the domestic money supply and (b) a once-and-for-all depreciation of the domestic currency.

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Also see the references at the end of Chapter 21.

INTERNet

Data on the exchange rate of the dollar, and interest rates, money supply, and inflation rate in the United States are found on the Federal Reserve Bank of St. Louis web site at:

http://www.research.stlouisfed.org/fred

Data on the exchange rates, interest rates, money supply, and inflation rates for most countries are found by following the links to the various countries' central banks on the web site of the Bank for International Settlement at:

http://www.bis.org

For a wide variety of global financial indexes on exchange rates, interest rates, inflation rates, and nominal and real GDP, see the MIT web site at:

http://eh.net/hmit

part 4

Open-Economy Macroeconomics and the International Monetary System

Part Four (Chapters 16–21) deals with open-economy macroeconomics. Chapter 16 examines how the exchange rate affects the nation's current account. Chapter 17 shows how the current account affects and is, in turn, affected by changes in the level of national income at home and abroad. Chapters 18 and 19 then deal with monetary and fiscal policies in open economies. Thus, Chapters 16–19 progressively build a complete model of the open economy. Specifically, Chapter 16 examines the partial equilibrium effect of exchange rate changes on the nation's current account. Chapter 17 extends the analysis of the goods market to the economy as a whole. Chapter 18 adds the money market and international capital flows and examines fiscal and monetary policies. Chapter 19 completes the model by dealing with prices and inflation. Finally, Chapters 20 and 21 examine the operation and future of the international monetary system.

The Price Adjustment Mechanism with Flexible and Fixed Exchange Rates

chapter 16

LEARNING GOALS:

After reading this chapter, you should be able to:

- Understand the effect of a change in the exchange rate on the nation's current account
- Understand the meaning and importance of the "stability of the foreign exchange market"
- Understand the meaning and importance of the exchange rate "pass-through"
- Explain how the gold standard operated

16.1 Introduction

In this chapter, we examine how a nation's current account is affected by price changes under flexible and fixed exchange rate systems. How the nation's current account is affected by income changes in the nation and abroad is examined in Chapter 17. Chapter 17 also presents a synthesis of the *joint* effect of price and income changes on the nation's current account and level of national income.

For simplicity, in this chapter we assume that there are no autonomous international private capital flows. That is, international private capital flows take place only as passive responses to cover (i.e., to pay for) temporary trade imbalances. We also assume that the nation wants to correct a deficit in its current account (and balance of payments) by exchange rate changes. (The correction of a current account and balance-of-payments *surplus* would generally require the opposite techniques.) Since this traditional exchange rate model is based on trade flows and the speed of adjustment depends on how responsive (elastic) imports and exports are to price (exchange rate) changes, it is called the trade or elasticity approach.

As we have seen in Chapter 15, international private capital flows are much larger than trade flows today, and so exchange rates reflect mostly financial rather than trade flows, especially in the short run. Trade flows, however, do have a strong effect on exchange rates in the long run. It is to isolate and identify the effect of trade flows on exchange rates and the effect of exchange rate changes on trade flows that we make the simplifying assumption of no autonomous international private capital flows in this chapter. Of course, in the real world both international financial and trade flows jointly determine exchange rates, but a fully acceptable theory of exchange rate determination that incorporates both financial and trade flows has not yet been developed. The closest we come to such a general theory is the portfolio balance model examined in Section 15.4.

In this chapter, Section 16.2 examines how the nation's current account is affected by exchange rate changes. Section 16.3 looks at the effect of exchange rate changes on domestic prices (the rate or inflation) in the country. Section 16.4 deals with the closely related topic of the stability of foreign exchange markets. Section 16.5 presents estimates of trade elasticities and explains why the current account usually responds with a time lag and only partially to a change in the nation's exchange rate. Finally, Section 16.6 describes the adjustment mechanism under the gold standard (the so-called price-specie-flow mechanism). In the appendix, we illustrate graphically the effect of a change in the exchange rate on domestic prices, derive mathematically the Marshall–Lerner condition for stability in foreign exchange markets, and show graphically how the gold points and international gold flows were determined under the gold standard.

16.2 Adjustment with Flexible Exchange Rates

In this section, we examine the method of correcting a deficit in a nation's current account or balance of payments by a depreciation or a devaluation of the nation's currency. A depreciation implies a flexible exchange rate system. A devaluation, on the other hand, refers to the deliberate (policy) increase in the exchange rate by the nation's monetary authorities from one fixed or pegged level to another. However, since both a depreciation and a devaluation operate on prices to bring about adjustment in the nation's current account and the balance of payments, they are both referred to as the *price adjustment mechanism* and are discussed together here. This is to be distinguished from the *income adjustment mechanism*, which relies on income changes in the nation and abroad and will be examined in the next chapter. We begin by examining the process of adjustment itself, and then show how the demand and supply schedules of foreign exchange are derived.

16.2A Balance-of-Payments Adjustments with Exchange Rate Changes

The process of correcting a deficit in a nation's balance of payments by a depreciation or devaluation of its currency is shown in Figure 16.1. In the figure, it is assumed that the United States and the European Monetary Union are the only two economies in the world and that there are no international capital flows, so that the U.S. demand and supply curves for euros reflect only trade in goods and services. The figure shows that at the exchange rate of $R = \$1/€1$, the quantity of euros demanded by the United States is €12 billion per year, while the quantity supplied is €8 billion. As a result, the United States has a deficit of €4 billion (AB) in its balance of payments.

If the U.S. demand and supply curves for euros were given by $D_€$ and $S_€$, a 20 percent devaluation or depreciation of the dollar, from $R = \$1/€1$ to $R = \$1.20/€1$, would completely eliminate the U.S. deficit. That is, at $R = \$1.20/€1$, the quantity of euros demanded

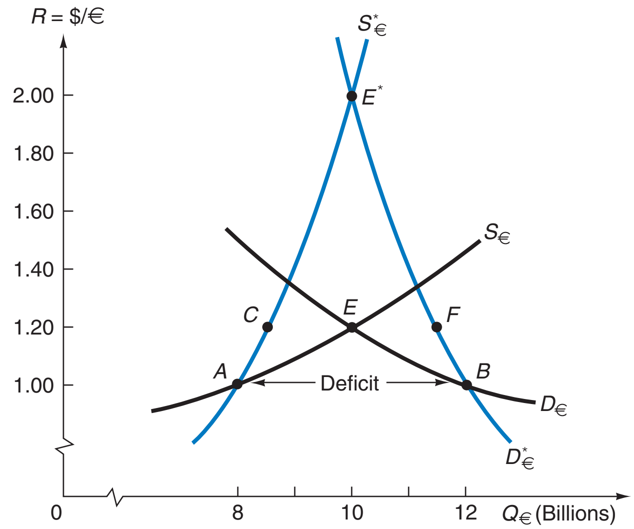

FIGURE 16.1. Balance-of-Payments Adjustments with Exchange Rate Changes.
At R = \$1/€1, the quantity of euros demanded by the United States is €12 billion per year, while the quantity supplied is €8 billion, so that the United States has a deficit of €4 billion (AB) in its balance of payments. With $D_€$ and $S_€$, a 20 percent depreciation or devaluation of the dollar would completely eliminate the deficit (point E). With $D^*_€$ and $S^*_€$, a 100 percent depreciation or devaluation would be required to eliminate the deficit (point E^*).

and the quantity supplied would be equal at €10 billion per year (point E in the figure), and the U.S. balance of payments would be in equilibrium. If, however, the U.S. demand and supply curves for euros were less elastic (steeper), as indicated by $D^*_€$ and $S^*_€$, the same 20 percent devaluation would only reduce the U.S. deficit to €3 billion (CF in the figure), and a 100 percent devaluation or depreciation of the dollar, from R = \$1/€1 to R = \$2/€1, would be required to completely eliminate the deficit (point E^* in the figure). Such a huge devaluation or depreciation of the dollar might not be feasible (for reasons examined later).

Thus, it is very important to know how elastic the U.S. demand and supply curves for euros are. In some cases, the shape of the deficit nation's demand and supply curves for foreign exchange may be such that a devaluation or depreciation would actually increase, rather than reduce or eliminate, the deficit in its balance of payments. These crucial questions are examined next by showing how a nation's demand and supply schedules for foreign exchange are derived.

16.2B Derivation of the Demand Curve for Foreign Exchange

The U.S. demand curve for euros ($D_€$) shown in Figure 16.1 is derived from the demand and supply curves of U.S. imports in terms of euros (shown in the left panel of Figure 16.2). On the other hand, the U.S. supply curve for euros ($S_€$) shown in Figure 16.1 is derived from the demand and supply curves of U.S. exports in terms of euros (shown in the right panel of Figure 16.2). Let us start with the derivation of the U.S. demand curve for euros ($D_€$).

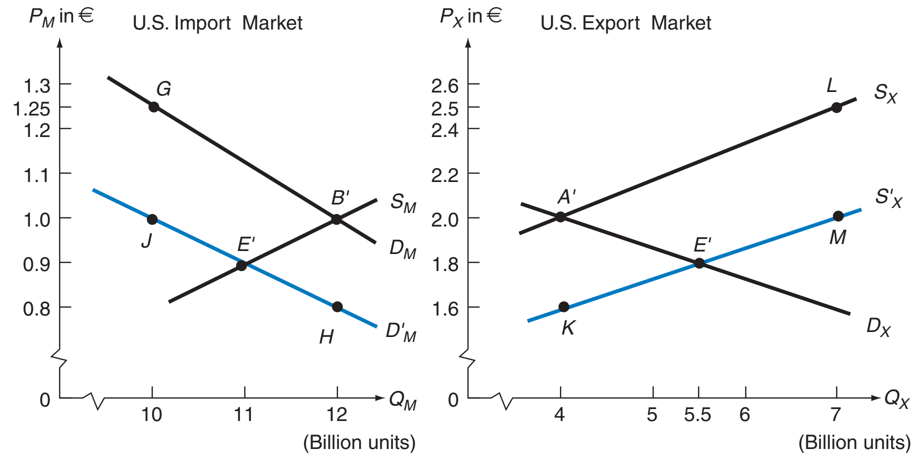

FIGURE 16.2. Derivation of the U.S. Demand and Supply Curves for Foreign Exchange. With D_M (at $R = \$1/€1$) and S_M in the left panel, $P_M = €1$ and $Q_M = 12$ billion units per year, so that the quantity of euros demanded by the United States is €12 billion (point B'). This corresponds to point B in Figure 16.1. With a 20 percent depreciation of the dollar, D_M shifts down to D'_M. Then $P_M = €0.9$ and $Q_M = 11$ billion units, so that the quantity of euros demanded by the United States falls to €9.9 billion (point E' in the left panel). This corresponds to point E (with €9.9 billion rounded to €10 billion) in Figure 16.1.

With D_X and S_X (at $R = \$1/€1$) in the right panel, $P_X = €2$ and $Q_X = 4$ billion, so that the quantity of euros supplied to the United States is €8 billion (point A'). This corresponds to point A in Figure 16.1. With a 20 percent depreciation or devaluation of the dollar, S_X shifts down to S'_X. Then $P_X = €1.8$ and $Q_X = 5.5$ billion units, so that the quantity of euros supplied to the United States rises to €9.9 billion (point E'). This corresponds to point E in Figure 16.1.

In the left panel of Figure 16.2, D_M is the U.S. demand for imports from the European Monetary Union in terms of euros at $R = \$1/€1$, while S_M is the EMU supply of imports to the United States. With D_M and S_M, the euro price of U.S. imports is $P_M = €1$, and the quantity of U.S. imports is $Q_M = 12$ billion units per year, so that the quantity of euros demanded by the United States is €12 billion (point B' in the left panel of Figure 16.2). This corresponds to point B on the U.S. $D_€$ in Figure 16.1.

When the dollar depreciates by 20 percent to $R = \$1.20/€1$, S_M remains unchanged, but D_M shifts down by 20 percent to D'_M (see the left panel of Figure 16.2). The reason is that for the United States to continue to demand 12 billion units of imports (as at point B' on D_M), the euro price of U.S. imports would have to fall from $P_M = €1$ to $P_M = €0.8$, or by the full 20 percent of the depreciation of the dollar, in order to leave the dollar price of imports unchanged (point H on D'_M). However, at euro prices below $P_M = €1$, the European Monetary Union will supply smaller quantities of imports to the United States (i.e., the European Monetary Union will move down along S_M), while the United States will demand smaller quantities of imports at euro prices above $P_M = €0.8$ (i.e., the United States will move up along), until a compromise on price at the new equilibrium point E' is reached (see the left panel of Figure 16.2). The student should reread this paragraph and the previous one, and carefully study the left panel of Figure 16.2 and its relationship to Figure 16.1 because this is a rather important topic and one of the most challenging in international finance.

Note that D'_M is not parallel to D_M because the shift is of a *constant percentage*. Thus, a 20 percent downward shift from point B'(€1.00) is only €0.20, while the same 20 percent downward shift from point G (€1.25) is €0.25. With D'_M and S_M, P_M = €0.9 and Q_M = 11 billion, so that the quantity of euros demanded by the United States falls to €9.9 billion (point E' in the left panel of Figure 16.2). This corresponds to point E (with €9.9 billion rounded to €10 billion) on $D_€$ in Figure 16.1. Thus, the quantity of euros demanded by the United States falls from €12 billion (given by point B' in the left panel of Figure 16.2) at R = \$1/€1 to €10 billion (given by point E') at R = \$1.20/€1. This corresponds to a movement from point B to point E along $D_€$ in Figure 16.1.

Only in the unusual case when D_M has zero elasticity (is vertical) will the U.S. quantity demanded of euros remain exactly the same after the devaluation or depreciation of the dollar as it was before, because in that case the downward shift in D_M leaves D_M unchanged (this is assigned as an end-of-chapter problem). Thus, aside from the unusual case where D_M is vertical, a devaluation or depreciation of the dollar always leads to a reduction in the U.S. quantity demanded of euros, so that $D_€$ (in Figure 16.1) is always negatively sloped. The reduction in the U.S. quantity demanded of euros when the dollar is devalued or is allowed to depreciate results because both the euro price of U.S. imports and the quantity of U.S. imports fall (see the left panel of Figure 16.2).

Furthermore, given S_M, the less elastic (steeper) is D_M, the smaller is the reduction in the U.S. quantity demanded of euros and the less elastic (steeper) is the U.S. demand curve for euros. (This is assigned as another end-of-chapter problem.) In that case, a 20 percent devaluation of the dollar might be represented by a movement from point B to point F along $D^*_€$ rather than by a movement from point B to point E along $D_€$ in Figure 16.1.

16.2c Derivation of the Supply Curve for Foreign Exchange

In the right panel of Figure 16.2, D_X is the EMU demand for U.S. exports in terms of euros, and S_X is the U.S. supply of exports to the European Monetary Union at R = \$1/€1. With D_X and S_X, the euro price of U.S. exports is P_X = €2, and the quantity of U.S. exports is Q_X = 4 billion units, so that the U.S. quantity of euros earned or supplied is €8 billion (point A' in the right panel of Figure 16.2). This corresponds to point A on $S_€$ in Figure 16.1.

When the dollar is devalued or is allowed to depreciate by 20 percent to R = \$1.20/€1, D_X remains unchanged, but S_X shifts down by 20 percent to S'_X (see the right panel of Figure 16.2). The reason is that the United States would now be willing to export 4 billion units (the same as at point A' on S_X) at the euro price of P_X = €1.6, or 20 percent lower than before the depreciation of the dollar, because each euro is now worth 20 percent more in terms of dollars (point K on S'_X in the figure). However, at euro prices below P_X = €2, the European Monetary Union will demand greater quantities of U.S. exports (i.e., the European Monetary Union will move down along D_X), while the United States will supply greater quantities of exports at euro prices above P_X = €1.6 (i.e., the United States will move up along S'_X), until the new equilibrium point E' is reached (see the right panel of Figure 16.2).

Note that S'_X is not parallel to S_X because the shift is of a constant percentage. With D_X and S'_X, P_X = €1.8 and Q_X = 5.5 billion units, so that the quantity of euros supplied to the United States increases to €9.9 billion (1.8 times 5.5). This is given by point E' in the right panel of Figure 16.2 and corresponds to point E (with €9.9 billion rounded to €10 billion) on $S_€$ in Figure 16.1. Thus, the quantity of euros supplied to the United States rises from €8 billion (given by point A' in the right panel of Figure 16.2) at R = \$1/€1 to €10 billion (given by point E') at $R = \$1.20/€1$. This corresponds to a movement from point A to point E along $S_€$ in Figure 16.1.

Devaluation of the dollar reduces the euro price but increases the quantity of U.S. exports (compare point E' to point A' in the right panel of Figure 16.2). What happens to the quantity of euros supplied to the United States then depends on the price elasticity of D_X between points A' and E'. Since in this case the percentage increase in Q_X exceeds the percentage reduction in P_X, D_X is price elastic, and the quantity of euros supplied to the United States increases. If D_X in the right panel of Figure 16.2 had been less elastic (steeper), the same 20 percent devaluation might have resulted in a movement from point A to point C along $S^*_€$ in Figure 16.1 rather than from point A to point E along $S_€$. Thus, the less elastic is D_X, the less elastic is the derived U.S. supply curve for euros ($S_€$).

If D_X had been unitary elastic, the devaluation or depreciation of the dollar would have left the U.S. quantity supplied of euros completely unchanged, so that the U.S. supply curve of euros would have been vertical, or have zero elasticity. (The same would be true if S_X were vertical, so that a depreciation or devaluation of the dollar would leave S_X unchanged.) Finally, if D_X had been price inelastic, a devaluation or depreciation of the dollar would have actually reduced the U.S. quantity supplied of euros, so that the U.S. supply curve of euros would have been negatively sloped. (These are assigned as end-of-chapter problems.) Thus, while the U.S. demand curve for euros is almost always negatively sloped, the U.S. supply curve of euros could be positively sloped, vertical, or even negatively sloped, depending on whether D_X is elastic, unitary elastic, or inelastic, respectively. In Section 16.4, we will see that this is crucial in determining the stability of the foreign exchange market.

16.3 Effect of Exchange Rate Changes on Domestic Prices and the Terms of Trade

Up to now, we have discussed the demand and supply curves of U.S. imports and exports in *terms of the foreign currency* (the euro) because we were interested in the effect of a devaluation or depreciation of the dollar on the U.S. balance of payments. However, a devaluation or depreciation of the dollar also has very important effects on U.S. prices *in terms of dollars*. That is, the depreciation or devaluation of the dollar stimulates the production of U.S. import substitutes and exports and will lead to a *rise* in prices in the United States. Thus, while a devaluation or depreciation of the dollar reduces the euro price of U.S. imports and exports (see Figure 16.2), it increases the dollar price of U.S. import substitutes and exports and is inflationary. This is illustrated graphically in Section A16.1 in the appendix for the more advanced or eager student.

The greater the devaluation or depreciation of the dollar, the greater is its inflationary impact on the U.S. economy and the less feasible is the increase of the exchange rate as a method of correcting the deficit in the U.S. balance of payments. Note that the increase in the dollar price of import substitutes and exports in the United States is a necessary incentive to U.S. producers to shift resources from the production of nontraded or purely domestic goods to the production of import substitutes and exports. But this also reduces the price advantage conferred on the United States by the devaluation or depreciation of the dollar. This is even more so for developing countries (see Case Study 16-1).

CASE STUDY 16-1 Currency Depreciation and Inflation in Developing Countries during the 1997–1998 East Asian Crisis

Table 16.1 gives the percentage of the currency depreciation and resulting inflation in four Asian countries (Thailand, Korea, Malaysia, and Indonesia) that faced serious financial and economic crises, including steep depreciation of their currencies, from the middle of 1997 to the fall of 1999 (refer to Case Study 11-1). These are some of the countries that grew so fast up to 1997 that they were called the "Asian Tigers." The table also provides data for three Latin American countries (Brazil, Chile, and Mexico) that also faced large currency depreciation and inflationary pressures during the same period of time (the second quarter of 1997 to the third quarter of 1999).

Table 16.1 shows that, except for Indonesia, the inflation rate in the Asian countries considered was less than one-third of the rate of depreciation of their currencies. In other words, about one-third of the price advantage that these nations received from currency depreciation was wiped out by the resulting inflation. In Indonesia, the rate was 72.5 percent (49.0/67.6). In Latin America, it was about 20 percent for Brazil and 46 percent for Chile. In Mexico, the rate of inflation was almost double the rate of depreciation of its currency. As we will see in Chapters 18 and 19, inflation does not depend only on the rate of depreciation of the nation's currency, but also on structural conditions and other forces at work in the nation.

TABLE 16.1. Currency Depreciation and Inflation, Selected Asian and Latin American Countries (in percentages, 1997:II to 1999:III)

Asian Countries	Currency Depreciation	Inflation
Indonesia	67.6	49.0
Malaysia	40.0	8.6
Korea	25.4	8.1
Thailand	32.1	9.3
Latin American Countries		
Brazil	42.6	8.3
Chile	19.4	8.9
Mexico	15.5	27.7

Source: International Monetary Fund, *International Financial Statistics* (Washington, D.C.: IMF, 2000).

A depreciation or devaluation is also likely to affect the nation's terms of trade. In Section 4.6, we defined the terms of trade of a nation as the ratio of the price of its export commodity to the price of its import commodity. Export and import prices must both be measured in terms of either the domestic or the foreign currency. Since the prices of both the nation's exports and imports rise in terms of the domestic currency as a result of its depreciation or devaluation, the terms of trade of the nation can rise, fall, or remain unchanged, depending on whether the price of exports rises by more than, less than, or the same percentages as the price of imports.

From Figure 16.2 we already know the exact change in the euro prices of U.S. exports and imports as a result of the 20 percent depreciation or devaluation of the dollar and we can use these prices to measure the change in the U.S. terms of trade. Before the depreciation or devaluation of the dollar, $P_X = €2$ (see point A' in the right panel of Figure 16.2) and $P_M = €1$ (point B' in the left panel), so that $P_X/P_M = 2/1 = 2$, or 200 percent. After the 20 percent depreciation or devaluation of the dollar, $P_X = €1.8$ (point E' in the right panel) and $P_M = €0.9$ (point E' in the left panel), so that $P_X/P_M = 1.8/0.9 = 2$, or 200 percent. Therefore, the U.S. terms of trade in this case remain unchanged. The conclusion would be the same if we used the *dollar* prices of U.S. exports and imports to measure the change in the U.S. terms of trade (see Figure 16.7 in the appendix). In general, however, we can expect the terms of trade of a nation to change (as discussed at the end of Section A16.2 in the appendix) when its currency is devalued or allowed to depreciate.

An interesting situation arises when an industrial nation begins to exploit a domestic natural resource that it previously imported. An example of this is provided by Great Britain when it started to extract substantial quantities of petroleum from the North Sea in 1976, thus eliminating the need to import it. The nation's exchange rate might then appreciate so much as to cause the nation to lose international competitiveness in its traditional industrial sector and even face deindustrialization. This is known as the Dutch disease. The name is derived from the Netherlands' loss of relative competitiveness in its traditional industrial sector as a result of the appreciation of the Dutch florin after the development of the Dutch natural gas industry, which eliminated the need for the Netherlands to import natural gas.

16.4 Stability of Foreign Exchange Markets

In this section, we examine the meanings of and the conditions for stability of the foreign exchange market. We have a stable foreign exchange market when a disturbance from the equilibrium exchange rate gives rise to automatic forces that push the exchange rate back toward the equilibrium level. We have an unstable foreign exchange market when a disturbance from equilibrium pushes the exchange rate further away from equilibrium.

16.4A Stable and Unstable Foreign Exchange Markets

A foreign exchange market is stable when the supply curve of foreign exchange is positively sloped or, if negatively sloped, is less elastic (steeper) than the demand curve of foreign exchange. A foreign exchange market is unstable if the supply curve is negatively sloped *and* more elastic (flatter) than the demand curve of foreign exchange. These conditions are illustrated in Figure 16.3.

The left panel of Figure 16.3 repeats $D_€$ and $S_€$ from Figure 16.1. With $D_€$ and $S_€$, the equilibrium exchange rate is $R = \$1.20/€1$, at which the quantity of euros demanded and the quantity supplied are equal at €10 billion per year (point E in the left panel of Figure 16.3). If, for whatever reason, the exchange rate fell to $R = \$1/€1$, there would be an excess demand for euros (a deficit in the U.S. balance of payments) of €4 billion *(AB)*, which would automatically push the exchange rate back up toward the equilibrium rate of $R = \$1.20/€1$. On the other hand, if the exchange rate rose to $R = \$1.40/€1$, there would be an excess quantity supplied of euros (a surplus in the U.S. balance of payments) of €3 billion *(NR)*, which would automatically drive the exchange rate back down toward

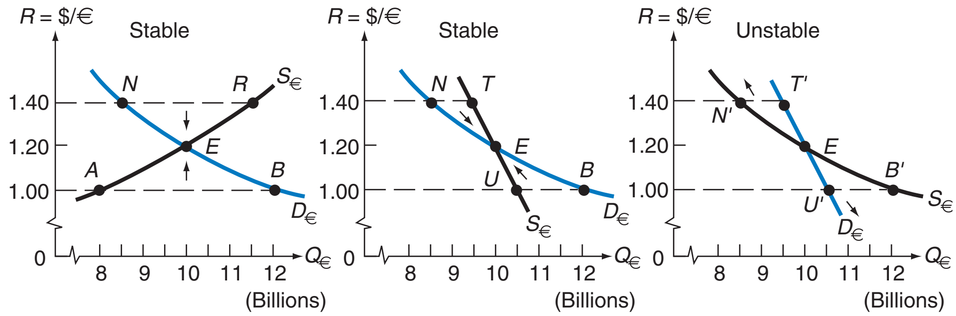

FIGURE 16.3. Stable and Unstable Foreign Exchange Markets.
In all three panels, the equilibrium exchange rate is $R = \$1.20/€1$, at which €10 billion are demanded and supplied per year. If, for whatever reason, the equilibrium is disturbed and the exchange rate falls, say to $R = \$1/€1$, the excess demand for foreign exchange in the left and center panels will push the exchange rate back up toward the equilibrium rate, but the excess supply of foreign exchange in the right panel will cause the exchange rate to fall even lower. Similarly, at $R = \$1.40/€1$, the excess supply in the left and center panels will drive the exchange rate down toward $R = \$1.20/€1$, but the excess demand in the right panel will push the exchange rate even higher. Thus, the left and center panels depict stable markets, while the right panel depicts an unstable market.

the equilibrium rate of $R = \$1.20/€1$. Thus, the foreign exchange market shown in the left panel of Figure 16.3 is *stable*.

The center panel of Figure 16.3 shows the same $D_€$ as in the left panel, but $S_€$ is now negatively sloped but steeper (less elastic) than $D_€$. Once again, the equilibrium exchange rate is $R = \$1.20/€1$ (point E). At the lower than equilibrium exchange rate $R = \$1/€1$, there is an excess demand for euros (a deficit in the U.S. balance of payments) equal to €1.5 billion *(UB)*, which automatically pushes the exchange rate back up toward the equilibrium rate of $R = \$1.20/€1$. At the higher than equilibrium exchange rate of $R = \$1.40/€1$, there is an excess supply of euros (a surplus in the U.S. balance of payments) of €1 billion *(NT)*, which automatically pushes the exchange rate back down toward the equilibrium rate of $R = \$1.20/€1$. In this case also, the foreign exchange market is *stable*.

The right panel of Figure 16.3 looks the same as the center panel, but the labels of the demand and supply curves are reversed, so that now $S_€$ is negatively sloped and flatter (more elastic) than $D_€$. The equilibrium exchange rate is still $R = \$1.20/€1$ (point E). Now, however, at any exchange rate lower than equilibrium, there is an excess quantity supplied of euros, which automatically drives the exchange rate even lower and farther away from the equilibrium rate. For example, at $R = \$1/€1$, there is an excess quantity supplied of euros of €1.5 billion *(U′B′)*, which pushes the exchange rate even lower and farther away from $R = \$1.20/€1$. On the other hand, at $R = \$1.40/€1$, there is an excess quantity demanded for euros of €1 billion *(N′T′)*, which automatically pushes the exchange rate even higher and farther away from the equilibrium rate. Thus, the foreign exchange market in the right panel is *unstable*.

When the foreign exchange market is unstable, a flexible exchange rate system increases rather than reduces a balance-of-payments disequilibrium. Then a revaluation or an appreciation rather than a devaluation of the deficit nation's currency is required to eliminate or reduce a deficit, while a devaluation would be necessary to correct a surplus. These policies are just the opposite of those required under a stable foreign exchange market. Determining whether the foreign exchange market is stable or unstable is, therefore, crucial. Only after the foreign exchange market has been determined to be stable will the elasticity of $D_€$ and $S_€$ (and thus the feasibility of correcting a balance-of-payments disequilibrium with a depreciation or devaluation of the deficit nation's currency) become important.

16.4B The Marshall–Lerner Condition

If we knew the exact shape of the demand and supply curves of foreign exchange in the real world, it would be rather easy (as indicated above) to determine whether the foreign exchange market in a particular case was stable or unstable and, if stable, the size of the depreciation or devaluation required to correct a deficit in the balance of payments. Unfortunately, this is not the case. As a result, we can only infer whether the foreign exchange market is stable or unstable and the elasticity of the demand and supply of foreign exchange from the demand for and supply of the nation's imports and exports.

The condition that tells us whether the foreign exchange market is stable or unstable is the Marshall–Lerner condition. The general formulation of the Marshall–Lerner condition is very complex and is presented in Section A16.2 in the appendix. Here we present and discuss the simplified version that is generally used. This is valid when the supply curves of imports and exports (i.e., S_M and S_X) are both infinitely elastic, or horizontal. Then the Marshall–Lerner condition indicates a stable foreign exchange market if the sum of the price elasticities of the demand for imports (D_M) and the demand for exports (D_X), in absolute terms, is greater than 1. If the sum of the price elasticities of D_M and D_X is less than 1, the foreign exchange market is unstable, and if the sum of these two demand elasticities is equal to 1, a change in the exchange rate will leave the balance of payments unchanged.

For example, from the left panel of Figure 16.2 we can visualize that if D_M were vertical and S_M horizontal, a depreciation or devaluation of the dollar would leave the U.S. demand for imports and thus the quantity of euros demanded by the United States completely unchanged. By itself, this would leave the U.S. balance of payments unchanged. From the right panel of Figure 16.2, we can visualize that given a horizontal S_X that shifts down by the percentage depreciation or devaluation of the dollar, the quantity of euros supplied to the United States rises, remains unchanged, or falls, depending on whether D_X is price elastic, unitary elastic, or inelastic, respectively. Thus, the sum of the price elasticities of D_M and D_X is equal to the price elasticity of D_X (because we have here assumed D_M to have zero price elasticity), and the U.S. balance of payments improves if the elasticity of D_X is greater than 1.

If D_M is negatively sloped so that it falls or shifts down by the amount of the depreciation of the dollar, the quantity of euros demanded by the United States falls, and this, by itself, improves the U.S. balance of payments. The reduction in the quantity of euros demanded by the United States is greater the larger is the price elasticity of D_M. Now, even if the price elasticity of D_X is less than 1 so that the quantity of euros supplied falls as a result of the depreciation of the dollar, the U.S. balance of payments will still improve as long as the *reduction in the quantity of euros demanded by the United States is greater than the reduction in the quantity of euros supplied to the United States*. For this to be the case, the sum of the elasticities of D_M and D_X must be greater than 1. The greater the amount by which the sum of these two elasticities exceeds 1, the greater is the improvement in the U.S. balance of payments for a given depreciation or devaluation of the dollar.

16.5 Elasticities in the Real World

In this section, we examine how the price elasticity of demand for imports and exports is measured and present some real-world estimates, discuss the J-curve effect, and examine the "pass-through" of exchange rate changes to domestic prices.

16.5A Elasticity Estimates

The Marshall–Lerner condition postulates a stable foreign exchange market if the sum of the price elasticities of the demand for imports and the demand for exports exceeds 1 in absolute value. However, the sum of these two elasticities will have to be substantially greater than 1 for the nation's demand and supply curves of foreign exchange to be sufficiently elastic to make a depreciation or devaluation feasible (i.e., not excessively inflationary) as a method of correcting a deficit in the nation's balance of payments. Thus, it is very important to determine the real-world value of the price elasticity of the demand for imports and exports.

Before World War II, it was widely believed not only that the foreign exchange market was stable but that the demand for and the supply of foreign exchange were very elastic. *Marshall*, among others, advanced this view in his *Money, Credit and Commerce*, published in 1923, but offered no empirical support for his belief.

During the 1940s, a number of econometric studies were undertaken to measure price elasticities in international trade. Two representative studies were undertaken by *Chang*, one in 1945 to measure the price elasticity of the demand for imports in 21 nations for which data existed from 1924 to 1938, and the other in 1948 to measure the price elasticity of the demand for exports of 22 nations over the same period. Chang found that the sum of the demand elasticities on the average barely exceeded 1, so that while the foreign exchange market was stable, the demand and supply curves of foreign exchange were probably fairly steep and inelastic (i.e., as $D^*_€$ and $S^*_€$ rather than as $D_€$ and $S_€$ in Figure 16.1). Other studies reached similar conclusions, confirming that the sum of the elasticities of the demand for imports and the demand for exports was either below or very close to 1 in absolute value. Thus, the prewar elasticity optimism was replaced by postwar elasticity pessimism.

However, writing in 1950, *Orcutt* provided some convincing reasons for the view that the regression technique used to estimate elasticities led to gross underestimation of the true elasticities in international trade. In short, it was likely that Marshall had been broadly correct, while the new econometric estimates, though seemingly more precise, were in fact likely to be far off the mark.

One reason advanced by Orcutt for the belief that the early econometric studies of the 1940s grossly underestimated the price elasticity of the demand for imports and exports results from the identification problem in estimation. This is explained with the aid of Figure 16.4. This figure is similar to the right panel of Figure 16.2 in that it shows the effect of a depreciation or devaluation of the dollar on the U.S. export market when the foreign demand curve and the U.S. supply curve of exports are expressed in terms of the foreign currency (euros). Suppose that points E and E^* are, respectively, the equilibrium points actually observed before and after the United States devalues its currency or allows it to depreciate (with none of the curves in Figure 16.4 being observed). The downward shift from S_X to S^*_X in Figure 16.4 is due to the depreciation or devaluation of the dollar (as in the right panel of Figure 16.2). The depreciation or devaluation of the dollar does not affect the foreign demand for U.S. exports.

If no other change (such as a change in tastes for U.S. exports) occurs, then the estimated foreign demand curve of U.S. exports is inelastic, as shown by D_X in Figure 16.4. However, equilibrium points E and E^* are also consistent with elastic demand curve D'_X, which shifts down to D''_X as a result, for example, of reduced foreign tastes for U.S. exports. Regression analysis will always measure the low elasticity of demand D_X even if the true demand is elastic and given by D'_X and D''_X (i.e., regression techniques fail to identify demand curves D'_X and D''_X). Since shifts in demand due to changes in tastes or other unaccounted forces frequently occur over time, estimated elasticities are likely to greatly underestimate true elasticities.

The estimated elasticities of the 1940s also measured short-run elasticities in that they were based on quantity responses to price changes over a period of one year or less. *Junz and Rhomberg* (1973) have identified five possible lags in the quantity response to price changes in international trade. These are the *recognition* lag before the price change becomes evident, the *decision* lag to take advantage of the change in prices, the *delivery* lag of new orders placed as a result of price changes, the *replacement* lag to use up available inventories before new orders are placed, and finally the *production* lag to change the output mix as a result of price changes. Junz and Rhomberg estimated that it takes about three years for 50 percent of the final long-run quantity response to take place and five years for 90 percent to occur. By measuring the quantity response only during the year of the price change, the early econometric studies of the 1940s greatly underestimated long-run elasticities.

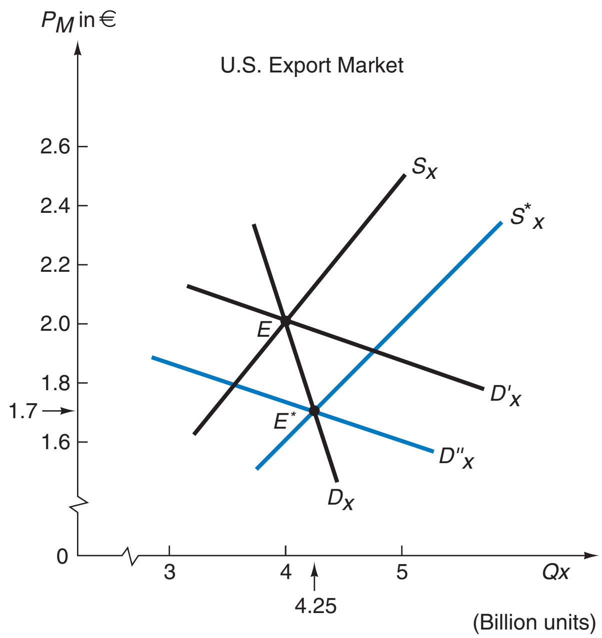

FIGURE 16.4. The Identification Problem.
Observed equilibrium points E and E^* are consistent either with nonshifting inelastic demand curve D_X or with elastic demand curve D'_X shifting down to D''_X. The estimation techniques used in the 1940s ended up measuring the elasticity of (inelastic) demand curve D_X even when the relevant demand curve was elastic D'_X.

16.5B The J-Curve Effect and Revised Elasticity Estimates

Not only are short-run elasticities in international trade likely to be much smaller than long-run elasticities, but a nation's trade balance may actually worsen soon after a devaluation or depreciation, before improving later on. This is due to the tendency of the domestic-currency price of imports to rise faster than export prices soon after the devaluation or depreciation, with quantities initially not changing very much. Over time, the quantity of exports rises and the quantity of imports falls, and export prices catch up with import prices, so that the initial deterioration in the nation's trade balance is halted and then reversed. Economists have called this tendency of a nation's trade balance to first deteriorate before improving as a result of a devaluation or depreciation in the nation's currency the J-curve effect. The reason is that when the nation's net trade balance is plotted on the vertical axis and time is plotted on the horizontal axis, the response of the trade balance to a devaluation or depreciation looks like the curve of a *J* (see Figure 16.5). The figure assumes that the original trade balance was zero.

Empirical studies by *Harberger* (1957), *Houthakker and Magee* (1969), *Stern, Francis, and Schumacher* (1976), *Spitaeller* (1980), *Artus and Knight* (1984) (summarized and reviewed by *Goldstein and Khan*, 1985), *Marquez* (1990), and *Hooper*, *Johnson, and Marquez* (1998) attempted to overcome some of the estimation problems raised by Orcutt. These studies generally confirmed the existence of a J-curve effect but also came up with *long-run* elasticities about twice as high as those found in the empirical studies of the 1940s. The upshot of all of this is that real-world elasticities are likely to be high enough to ensure stability of the foreign exchange market in the short run and also to result in fairly elastic demand and supply schedules for foreign exchange in the long run. In the very short run

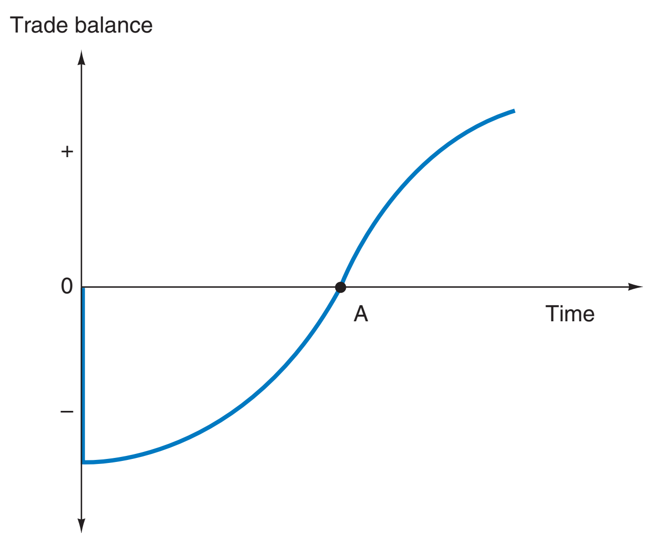

FIGURE 16.5. The J-Curve.
Starting from the origin and a given trade balance, a devaluation or depreciation of the nation's currency will first result in a deterioration of the nation's trade balance before showing a net improvement (after time *A*).

(i.e., during the first six months), however, the so-called *impact elasticities* are small enough to result in a deterioration in the current account immediately following a depreciation or a devaluation and before an improvement occurs (the J-curve effect). Case Studies 16-2 and 16-3 give values of estimated price elasticities for imports and exports for various nations or groups of nations. Case Studies 16-4 and 16-5 examine the effect of exchange rate changes on the U.S. current account and trade balances, while Case Study 16-6 examines the effect of exchange rate changes on the current account of the leading European countries during the financial crisis of the early 1990s.

CASE STUDY 16-2 Estimated Price Elasticities in International Trade

Table 16.2 presents the absolute value of the estimated impact, short-run, and long-run elasticities for the imports and exports of *manufactured goods* of 14 industrial countries. As indicated by the impact elasticities, the foreign exchange market seems to be unstable over a six-month adjustment period or in the very short run, thus confirming the J-curve effect. For a one-year adjustment period, the short-run elasticities indicate that the Marshall–Lerner condition is met for most countries, but just barely. In the long run (i.e., over many years), the unweighted average of the sum of the import and export price elasticities is 1.92 for the seven largest industrial countries, 2.07 for the smaller industrial countries, and 2.00 for all 14 countries. This implies fairly elastic demand and supply curves for foreign exchange.

TABLE 16.2. Estimated Price Elasticities of Demand for Imports and Exports of Manufactured Goods

Country	Imports: Impact	Imports: Short Run	Imports: Long Run	Exports: Impact	Exports: Short Run	Exports: Long Run
United States	–	1.06	1.06	0.18	0.48	1.67
Japan	0.16	0.72	0.97	0.59	1.01	1.61
Germany	0.57	0.77	0.77	–	–	1.41
United Kingdom	0.60	0.75	0.75	–	–	0.31
France	–	0.49	0.60	0.20	0.48	1.25
Italy	0.94	0.94	0.94	–	0.56	0.64
Canada	0.72	0.72	0.72	0.08	0.40	0.71
Austria	0.03	0.36	0.80	0.39	0.71	1.37
Belgium	–	–	0.70	0.18	0.59	1.55
Denmark	0.55	0.93	1.14	0.82	1.13	1.13
Netherlands	0.71	1.22	1.22	0.24	0.49	0.89
Norway	–	0.01	0.71	0.40	0.74	1.49
Sweden	–	–	0.94	0.27	0.73	1.59
Switzerland	0.25	0.25	0.25	0.28	0.42	0.73

Source: J. R. Artus and M. D. Knight, *Issues in the Assessment of Exchange Rates of Industrial Countries*, Occasional Paper 29 (Washington, D.C.: International Monetary Fund, July 1984), Table 4, p. 26. The dashes indicate values that are not available.

CASE STUDY 16-3 Other Estimated Price Elasticities in International Trade

Table 16.3 gives the absolute value of the estimated short-run and long-run price elasticity of demand for imports and exports of goods and services of the G-7 countries (United States, Japan, Germany, the United Kingdom, France, Italy, and Canada). The elasticities were estimated using quarterly data from the mid-1950s or early 1960s (depending on the data availability for the different countries) through 1996 or 1997. The results show that short-run price elasticities are very small and that the foreign exchange market seems unstable (i.e., the Marshall–Lerner condition is not met, thus confirming the J-curve effect) for all G-7 countries. In the long run (i.e., over several years), however, the sum of the price elasticity of demand for imports and exports exceeds 1 (so that the Marshall–Lerner condition is satisfied) for five of the seven countries (the exceptions being Germany and France) and for the group as a whole (the unweighted average of the sum of the import and export price elasticities being 1.26). Estimated price elasticities would have been even higher if petroleum imports (which have very low price elasticities) had been excluded from the data. Other estimates by *Chinn* (2005), *Crane, Crowley, and Quayyam* (2007), *Kee, Nicita, and Olarreaga* (2008), and *Imbs and Mejean* (2009) find price elasticities in international trade generally higher than those given in the table below.

TABLE 16.3. Estimated Price Elasticities for Imports and Exports

	Imports		Exports	
Country	Short Run	Long Run	Short Run	Long Run
United States	0.1	0.3	0.5	1.5
Japan	0.1	0.3	0.5	1.0
Germany	0.2	0.6	0.1	0.3
United Kingdom	0.0	0.6	0.2	1.6
France	0.1	0.4	0.1	0.2
Italy	0.0	0.4	0.3	0.9
Canada	0.1	0.9	0.5	0.9

Source: P. Hooper, K. Johnson, and J. Marquez, ''Trade Elasticities for the G-7 Countries,'' Board of Governors of the Federal Reserve System, International Finance Discussion Papers No. 609, April 2008, pp. 1–20.

CASE STUDY 16-4 Effective Exchange Rate of the Dollar and U.S. Current Account Balance

Figure 16.6 plots the effective exchange rate index of the dollar (defined as the number of foreign currency units per dollar, with 1995 = 100 on the right scale) and the U.S. current account balance (in billions of dollars on the left scale) from 1980 to 2011. The figure shows that the dollar appreciated by almost 40 percent on a trade-weighted basis from 1980 to 1985, but the U.S. current account balance only started to really deteriorate in 1982. The U.S. current account then continued to deteriorate until 1987, even though the dollar started to sharply depreciate in 1985. Thus, the U.S. current account seemed to respond with a long lag (about two years) to changes in

(continued)

CASE STUDY 16-4 Continued

the exchange rate of the dollar. From 1987 to 1991, the U.S. current account improved but then deteriorated until 1994, even though the exchange rate did not change very much from 1987 to 1991. The dollar appreciated from 1995 until 2001 (except in 1999) and the U.S. current account deteriorated (except in 2001), but deteriorated even more sharply from 2002 to 2006, even though the dollar depreciated. In 2009, the dollar appreciated but the current account improved, and afterwards, the dollar depreciated and the U.S. current account. Thus, the U.S. current account seems to respond with about a two-year lag to changes in the effective exchange rate of the dollar in some years and not at all, or even perversely, in other years. Obviously, other powerful forces (discussed in the next chapter) also affect the U.S. current account.

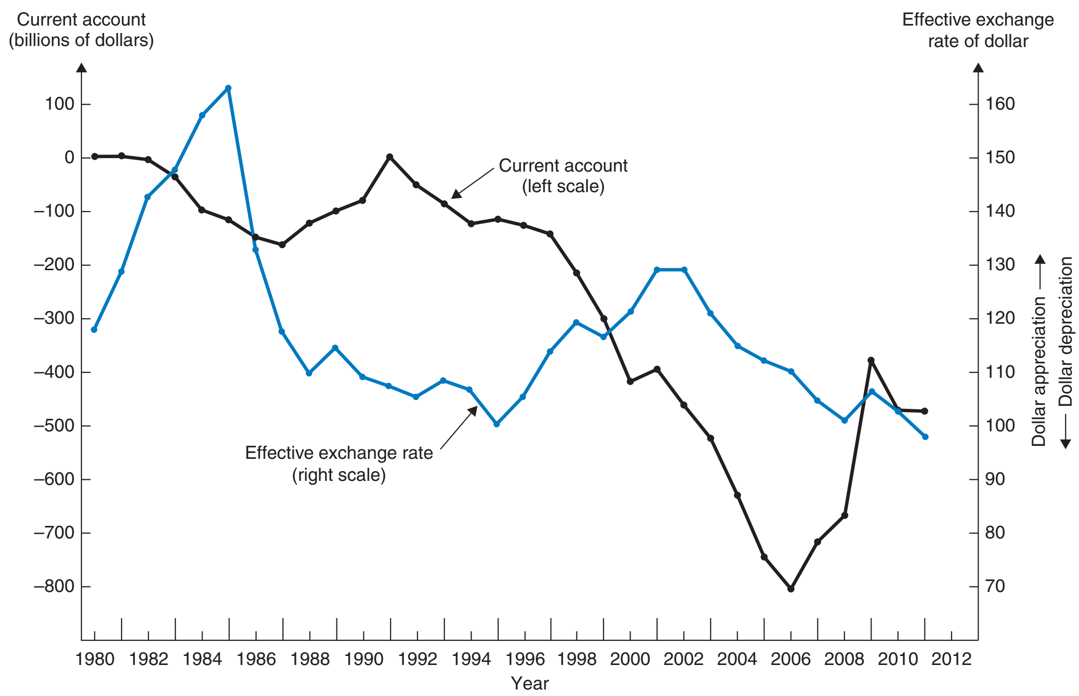

FIGURE 16.6. Effective Exchange Rate of the Dollar and U.S. Current Account Balance, 1980–2011. The U.S. current account seems to respond to exchange rate changes with a long lag (improving when the dollar depreciates and deteriorating when the dollar appreciates), but not always (as in the period from 2002 to 2006 when the dollar depreciated and the U.S. current account deteriorated sharply).

Sources: International Monetary Fund, *International Financial Statistics* and U.S. Department of Commerce, *Survey of Current Business*, various issues.

CASE STUDY 16-5 Dollar Depreciation and the U.S. Current Account Balance

Table 16.4 shows the estimated effect of a dollar depreciation of either 30 percent with respect to other OECD (industrialized) countries or 22.5 percent with respect to all world currencies on the U.S. growth rate, inflation rate, trade balance, current account balance, and short-term interest rates. Effects are measured in relation to what would have been the case in the United States without the dollar depreciation over the 2004–2009 period (base line scenario). The table shows average yearly effects over the 2004–2009 period and the outcome at the end of the period (i.e., in 2009) as compared to the baseline scenario without the dollar depreciation.

From the table, we see that a 30 percent depreciation of the dollar with respect to the currencies of OECD countries (the effects are the same or very similar if the dollar depreciates by 22.5 percent with respect to all currencies) leaves the average growth rate of real GDP at 3.3 percent over the 2004–2009 period. The average inflation rate would be 2.6 percent per year instead of the 1.3 percent rate assumed in the baseline scenario, the average trade balance would be −3.4 percent of GDP instead of −4.7 percent, the average current account balance would be −4.2 percent of GDP instead of −5.1 percent, and the average short-term interest rate would be 6.9 percent instead of 3.9 percent. The directions of these effects are as anticipated; that is, besides improving the trade and current account balance, a dollar depreciation stimulates U.S. exports and growth, but it is also inflationary, which leads to higher interest rates, which in turn dampen growth.

The last two columns of the table show the outcome in 2009 as compared to the baseline scenario; that is, U.S. growth would be only one-half of 1 percent (rounding errors) lower with respect to the baseline scenario, the price level would be 7.6 percent higher, the trade balance would improve by 2.0 percentage points (from −4.7 to −3.3 percent of GDP), the current account balance would also improve by 1.4 percentage points (from −5.1 to −4.2 percent of GDP), and short-term interest rates would be 3 percentage points higher (6.9 instead of 3.9 percent). We could thus conclude that it would take a large dollar depreciation to result in a moderate improvement in the U.S. trade and current account balances.

TABLE 16.4. Effect of a Dollar Depreciation on the U.S. Trade and Current Account Balances, 2004–2009

	Yearly Averages: 2004–2009			End Point (2009) Scenario with Respect to Baseline	
	Baseline Scenario	Only OECD Exchange Rates Adjust[a]	All Exchange Rates Adjust[b]	Only OECD Exchange Rates Adjust	All Exchange Rates Adjust
Growth of real GDP[c]	3.3	3.3	3.3	−0.5	−0.3
Rate of inflation[c]	1.3	2.6	2.2	7.6	5.1
Trade balance[d]	−4.7	−3.4	−3.4	2.0	1.9
Current account balance[d]	−5.1	−4.2	−4.3	1.4	1.3
Short-term interest rate[e]	3.9	6.9	6.9	3.0	3.0

[a]Effective depreciation of the dollar of 30% with respect to OECD currencies.
[b]Effective depreciation of the dollar of 22.5% with respect to all currencies.
[c]Numbers in the first three columns refer to yearly average rates of change; numbers in the last two columns show the *level* in 2009 relative to the baseline.
[d]Percent of GDP; values in last two columns need not add up to the values in the first two columns.
[e]Percent.
Source: Organization for Economic Cooperation and Development, *Economic Outlook* (Paris: OECD, June 2004).

CASE STUDY 16-6 Exchange Rates and Current Account Balances during the European Financial Crisis of the Early 1990s

Table 16.5 shows that the European financial crisis of the early 1990s (examined in detail in Chapter 20) resulted in a currency depreciation of 22.1 percent in Italy and 8.0 percent in the United Kingdom, as contrasted with an appreciation of the real effective exchange rate of Germany and France. The table shows that the current account of all four countries improved between 1992 and 1995, but that of Italy (the country with the largest depreciation) improved the most. Since the current account of Germany and France also improved (despite the appreciation of their currencies), the current account of a nation must reflect other forces at work as well. These will be examined in the next chapter. Note that most of the improvement in Italy's current account occurred within one year of depreciation of the lira.

TABLE 16.5. Real Effective Exchange Rates and Current Account Balances in Italy, Great Britain, Germany, and France, 1992–1995

Country	Real Effective Exchange Rate Index (1995 = 100)				Current Account Balance (in billions of dollars)			
	1992	1993	1994	1995	1992	1993	1994	1995
Italy	122.1	106.0	107.2	100.0	3.1	32.9	35.4	44.1
United Kingdom	108.0	105.0	103.3	100.0	−22.9	−20.0	−17.0	−18.5
Germany	83.0	87.6	92.5	100.0	28.2	41.2	50.9	65.1
France	88.6	92.2	95.6	100.0	2.4	7.2	7.2	11.0

Source: Organization for Economic Cooperation and Development, *Economic Outlook* (Paris: OECD, December 2000).

16.5c Currency Pass-Through

Not only are there usually lags in the response of a nation's trade and current account balances to a depreciation of its currency (and there may even be a perverse response for a while—the J-curve effect), but also the increase in the domestic price of the imported commodity may be smaller than the amount of the depreciation—even after lags. That is, the pass-through from depreciation to domestic prices may be less than complete. For example, a 10 percent depreciation in the nation's currency may result in a less than 10 percent increase in the domestic-currency price of the imported commodity in the nation. The reason is that foreign firms, having struggled to successfully establish and increase their market share in the nation, may be very reluctant to risk losing it by a large increase in the price of its exports and are usually willing to absorb at least some of the price increase that they could charge out of their profits. Specifically, a foreign firm may only increase the price of its export commodity by 4 percent and accept a 6 percent reduction in its profits when the other nation's currency depreciates (and its currency appreciates) by 10 percent for fear of losing market share. That is, the pass-through is less than 1. The pass-through is higher in the long run than the short run and higher for industrial goods than for other goods.

In the United States, the pass-through of a dollar depreciation has been estimated to be only about 42 percent in the long run. This means that the dollar price of U.S. imports tends to increase only by about 42 percent of a dollar depreciation after one year, with the remaining 58 percent being absorbed out of exporters' profits (see Case Study 16-7). There is also mounting empirical evidence that the "pass-though" from exchange rate changes to prices (i.e., firm's pricing power) declined during the low-inflationary environment of the past two decades and it is lower for trade in primary commodities than for trade in manufactured products and in trade with China (see *Taylor*, 1999; *McCarthy*, 1999; *Chinn*,

CASE STUDY 16-7 Exchange Rate Pass-Through to Import Prices in Industrial Countries

Table 16.6 gives the short-run and the long-run exchange rate pass-through elasticities to import prices for the G-7 countries and a number of other countries estimated for the period from 1975 through 2003. From the table, we see that the short-run exchange rate pass-through elasticities range from a low of 0.23 in the United States to a high of 0.79 in the Netherlands, for the unweighted average of 0.53 for all 14 countries included in the table. This means that in the short run, a 10 percent depreciation of dollar results in a 2.3 percent increase in import prices in the United States while a 10 percent depreciation of the Dutch florin leads to an 7.9 percent increase in import prices in the Netherlands. The long-run exchange rate pass-through elasticities range from a low of 0.35 for Italy to a high of 1.13 in Japan, for an unweighted average of 0.70 for all 14 countries included in the table.

TABLE 16.6. Exchange Rate Pass-Through Elasticities into Import Prices in Industrial Countries

Country	Short-Run Elasticity	Long-Run Elasticity
United States	0.23	0.42
Japan	0.43	1.13
Germany	0.55	0.80
United Kingdom	0.36	0.46
France	0.53	0.98
Italy	0.35	0.35
Canada	0.75	0.65
Australia	0.56	0.67
Hungary	0.51	0.77
Netherlands	0.79	0.84
Poland	0.56	0.78
Spain	0.68	0.70
Sweden	0.48	0.38
Switzerland	0.68	0.93
Unweighted Average	0.53	0.70

Source: J. M. Campa and L. S. Goldberg, "Exchange Rate Pass-Through into Import Prices?" *The Review of Economics and Statistics*, November 2005, pp. 679–690.

2005; *Ihrig, Marazzi, and Rothenberg*, 2006; *Marquez and Schindler*, 2007; *Takhtamanova*, 2008; *Mishkin*, 2008; *Kee, Nicita, and Olarrega*, 2008; and *Imbs and Mejean*, 2009).

Exporters may also be reluctant to increase prices by the full amount of the dollar depreciation if they are not convinced that the depreciation of the dollar will persist and not be reversed in the near future. Since it is very costly to plan and build or dismantle production facilities and enter or leave new markets, they do not want to risk losing their market by a large increase in the price of their exports. This has been referred to as the *beachhead effect*. This effect was clearly evident during the sharp depreciation of the dollar from 1985 to 1988 when Japanese automakers avoided increasing the dollar price of their automobile exports to the United States for as long as possible in order to hold on to their share of the U.S. market and then reluctantly increased prices only by a small amount. In the process, their profit margins fell sharply, and they even incurred losses—prompting accusations of dumping on the part of the American competitors. At the same time, U.S. automakers chose to increase prices in order to rebuild their profit margins instead of holding the line on prices and recapturing market share from the Japanese (refer to Case Study 9-2).

16.6 Adjustment under the Gold Standard

In this last section of Chapter 16, we examine the operation of the international monetary system known as the gold standard. The gold standard also relies on an automatic *price* mechanism for adjustment but of a different type from the one operating under a flexible exchange rate system.

16.6A The Gold Standard

The gold standard operated from about 1880 to the outbreak of World War I in 1914. An attempt was made to reestablish the gold standard after the war, but it failed in 1931 during the Great Depression. It is highly unlikely that the gold standard will be reestablished in the near future—if ever. Nevertheless, it is very important to understand the advantages and disadvantages inherent in the operation of the gold standard, not only for its own sake, but also because they were (to some extent) also true for the fixed exchange rate system (the Bretton Woods system, or gold-exchange standard) that operated from the end of World War II until it collapsed in 1971.

Under the gold standard, each nation defines the gold content of its currency and passively stands ready to buy or sell any amount of gold at that price. Since the gold content in one unit of each currency is fixed, exchange rates are also fixed. For example, under the gold standard, a £1 gold coin in the United Kingdom contained 113.0016 grains of pure gold, while a \$1 gold coin in the United States contained 23.22 grains. This implied that the dollar price of the pound, or the exchange rate, was $R = \$/£ = 113.0016/23.22 = 4.87$. This is called the mint parity. (Since the center of the gold standard was London, not Frankfurt, our discussion is in terms of pounds sterling and dollars, instead of euros and dollars.)

Since the cost of shipping £1 worth of gold between New York and London was about 3 cents, the exchange rate between the dollar and the pound could never fluctuate by more than 3 cents above or below the mint parity (i.e., the exchange rate could not rise above

4.90 or fall below 4.84). The reason is that no one would pay more than \$4.90 for £1, since he could always purchase \$4.87 worth of gold at the U.S. Treasury (the Federal Reserve Bank of New York was only established in 1913), ship it to London at a cost of 3 cents, and exchange it for £1 at the Bank of England (the U.K. central bank). Thus, the U.S. supply curve of pounds became infinitely elastic (horizontal) at the exchange rate of R = \$4.90/£1. This was the gold export point of the United States.

On the other hand, the exchange rate between the dollar and the pound could not fall below \$4.84. The reason for this is that no one would accept less than \$4.84 for each pound he wanted to convert into dollars because he could always purchase £1 worth of gold in London, ship it to New York at a cost of 3 cents, and exchange it for \$4.87 (thus receiving \$4.84 net). As a result, the U.S. demand curve of pounds became infinitely elastic (horizontal) at the exchange rate of R = \$4.84/£1. This was the gold import point of the United States.

The exchange rate between the dollar and the pound was determined at the intersection of the U.S. demand and supply curves of pounds between the gold points and was prevented from moving outside the gold points by U.S. gold sales or purchases. That is, the tendency of the dollar to depreciate, or the exchange rate to rise above R = \$4.90/£1, was countered by gold shipments from the United States. These gold outflows measured the size of the U.S. balance-of-payments deficit. On the other hand, the tendency of the dollar to appreciate, or the exchange rate to fall below R = \$4.84/£1, was countered by gold shipments to the United States. These gold inflows measured the size of the surplus in the U.S. balance of payments. (For the interested reader, this process is shown graphically in Section A16.4 in the appendix.)

Since deficits are settled in gold under this system and nations have limited gold reserves, deficits cannot go on forever but must soon be corrected. We now turn to the adjustment mechanism that automatically corrects deficits and surpluses in the balance of payments under the gold standard.

16.6B The Price-Specie-Flow Mechanism

The automatic adjustment mechanism under the gold standard is the price-specie-flow mechanism. This operates as follows to correct balance-of-payments disequilibria. Since each nation's money supply under the gold standard consisted of either gold itself or paper currency backed by gold, the money supply would fall in the deficit nation and rise in the surplus nation. This caused internal prices to fall in the deficit nation and rise in the surplus nation. As a result, the exports of the deficit nation would be encouraged and its imports would be discouraged until the deficit in its balance of payments was eliminated.

The reduction of internal prices in the deficit nation as a result of the gold loss and reduction of its money supply was based on the quantity theory of money. This can be explained by using Equation (16-1),

$$MV = PQ \tag{16-1}$$

where M is the nation's money supply, V is the velocity of circulation of money (the number of times each unit of the domestic currency turns over on the average during one year),

P is the general price index, and Q is physical output. Classical economists believed that V depended on institutional factors and was constant. They also believed that, apart from temporary disturbances, there was built into the economy an automatic tendency toward full employment without inflation (based on their assumption of perfect and instantaneous flexibility of all prices, wages, and interests). For example, any tendency toward unemployment in the economy would be automatically corrected by wages falling sufficiently to ensure full employment. Thus, Q was assumed to be fixed at the full-employment level. With V and Q constant, a change in M led to a direct and proportional change in P (see Equation (16-1)).

Thus, as the deficit nation lost gold, its money supply would fall and cause internal prices to fall proportionately. For example, a deficit in the nation's balance of payments and gold loss that reduced M by 10 percent would also reduce P by 10 percent in the nation. This would encourage the exports of the deficit nation and discourage its imports. The opposite would take place in the surplus nation. That is, the increase in the surplus nation's money supply (due to the inflow of gold) would cause its internal prices to rise. This would discourage the nation's exports and encourage its imports. The process would continue until the deficit and surplus were eliminated.

Note that the adjustment process is automatic; it is triggered as soon as the balance-of-payments disequilibrium arises and continues to operate until the disequilibrium is entirely eliminated. Note also that the adjustment relies on a change in internal prices in the deficit and surplus nations. Thus, while adjustment under a flexible exchange rate system relies on changing the external value of the national currency, adjustment under the gold standard relies on changing internal prices in each nation. Adjustment under the gold standard also relies on high price elasticities of exports and imports in the deficit and surplus nations, so that the volumes of exports and imports respond readily and significantly to price changes.

David Hume introduced the price-specie-flow mechanism in 1752 and used it to demonstrate the futility of the mercantilists' belief that a nation could continuously accumulate gold by exporting more than it imported (refer to Section 2.2). Hume pointed out that as a nation accumulated gold, domestic prices would rise until the nation's export surplus (which led to the accumulation of gold in the first place) was eliminated. The example Hume used to make this point is unsurpassed: That is, it is futile to attempt to raise the water level (the amount of gold) above its natural level in some compartment (nation) as long as the compartments are connected with one another (i.e., as long as nations are connected through international trade).

Passively allowing the nation's money supply to change for balance-of-payments considerations meant that nations could not use monetary policy for achieving full employment without inflation. Yet, this created no difficulties for classical economists, since (as pointed out earlier) they believed that there was an automatic tendency in the economic system toward full employment without inflation. Note, however, that for the adjustment process to operate, nations were not supposed to *sterilize* (i.e., neutralize) the effect on their money supply of a deficit or surplus in their balance of payments. On the contrary, the rules of the game of the gold standard required a deficit nation to reinforce the adjustment process by further restricting credit and a surplus nation to expand credit further. (The actual experience under the gold standard is discussed in Chapter 21.)

SUMMARY

1. In this chapter, we examined the traditional trade or elasticity approach to exchange rate determination. This assumes that there are no autonomous international private financial flows (i.e., international private capital flows take place only as passive responses to cover or pay for temporary trade imbalances) and shows how a current account (and balance-of-payments) deficit can be corrected automatically by a depreciation of the nation's currency under flexible exchange rates or by (the policy of) devaluing the nation's currency with fixed exchange rates. The opposite would be the case for a current account (and balance-of-payments) surplus.

2. A nation can usually correct a deficit in its balance of payments by devaluing its currency or allowing it to depreciate. The more elastic are the demand and supply curves of foreign exchange, the smaller is the devaluation or depreciation required to correct a deficit of a given size. The nation's demand for foreign exchange is derived from the demand for and supply of its imports in terms of the foreign currency. The more elastic is the latter, the more elastic is the former.

3. A devaluation or depreciation of a nation's currency increases the domestic currency prices of the nation's exports and import substitutes and is inflationary.

4. The foreign exchange market is stable if the supply curve of foreign exchange is positively sloped or, if negatively sloped, is steeper (less elastic) than the demand curve of foreign exchange. According to the Marshall–Lerner condition, the foreign exchange market is stable if the (absolute value of the) sum of the price elasticities of the demands for imports and exports exceeds 1. This holds when the supply elasticities of imports and exports are infinite. If the sum of the two demand elasticities equals 1, a change in the exchange rate will leave the nation's balance of payments unchanged. If, on the other hand, the sum of the two demand elasticities is less than 1, the foreign exchange market is unstable, and a depreciation will increase rather than reduce the nation's deficit.

5. Empirical estimates of elasticities in international trade conducted during the 1940s found that foreign exchange markets were either unstable or barely stable and led to the so-called elasticity pessimism. However, these econometric studies seriously underestimated true elasticities, especially because of the problem of identifying shifts in demand and because they estimated short-run rather than long-run elasticities. More recent empirical studies have shown that foreign exchange markets are generally stable and that demand and supply curves of foreign exchange may be fairly elastic in the long run. Current account disequilibria seem to respond only with a long lag and not sufficiently to exchange rate changes. A devaluation or depreciation may result in a deterioration in the nation's trade balance before an improvement takes place (the J-curve effect). There is usually only a partial pass-through of a depreciation in a nation's currency to the price of its imports.

6. Under the gold standard, each nation defines the gold content of its currency and passively stands ready to buy or sell any amount of gold at that price. This results in a fixed exchange rate called the mint parity. The exchange rate is determined at the intersection of the nation's demand and supply curves of the foreign currency between the gold points and is prevented from moving outside the gold points by the nation's sales or purchases of gold. The adjustment mechanism under the gold standard is the price-specie-flow mechanism. The loss of gold by the deficit nation reduces its money supply. This causes domestic prices to fall, thus stimulating the nation's exports and discouraging its imports until the deficit is eliminated. The opposite process corrects a surplus.

A LOOK AHEAD

In Chapter 17, we examine in detail the automatic income adjustment mechanism. This relies on induced changes in the national income of the deficit and surplus nations to bring about adjustment. The examination of the income adjustment mechanism requires a review of the concept of the equilibrium level of national income and the multiplier. Since the automatic price, income, and monetary adjustment mechanisms operate side-by-side in the real world, the last two sections of Chapter 17 present a synthesis of their operation. Chapters 18 and 19 will then deal with adjustment policies or open-economy macroeconomics.

KEY TERMS

Devaluation, p. 508
Dutch disease, p. 514
Elasticity pessimism, p. 517
Gold export point, p. 527
Gold import point, p. 527
Gold standard, p. 526
Identification problem, p. 517
J-curve effect, p. 519
Marshall–Lerner condition, p. 516
Mint parity, p. 526
Pass-through, p. 524
Price-specie-flow mechanism, p. 527
Quantity theory of money, p. 527
Rules of the game of the gold standard, p. 528
Stable foreign exchange market, p. 514
Trade or elasticity approach, p. 507
Unstable foreign exchange market, p. 514

QUESTIONS FOR REVIEW

1. How does a depreciation or devaluation of a nation's currency operate to eliminate or reduce a deficit in its current account or balance of payments?

2. Why is a depreciation or devaluation of the nation's currency not feasible to eliminate a deficit if the nation's demand and supply curves of foreign exchange are inelastic?

3. How is the nation's demand curve for foreign exchange derived? What determines its elasticity?

4. How is the nation's supply curve of foreign exchange derived? What determines its elasticity?

5. Why is a devaluation or depreciation inflationary?

6. What shape of the demand and supply curves of foreign exchange will make the foreign exchange market stable? unstable?

7. What is the Marshall–Lerner condition for a stable foreign exchange market? for an unstable market? for a depreciation to leave the nation's balance of payments unchanged?

8. Why will a depreciation of the deficit nation's currency increase rather than reduce the balance-of-payments deficit when the foreign exchange market is unstable?

9. What is meant by elasticity pessimism? How did it arise?

10. What is the J-curve effect?

11. Why may elasticity pessimism be unjustified? What is the prevailing view today as to the stability of foreign exchange markets and the elasticity of the demand and supply curves of foreign exchange?

12. What is meant by a currency pass-through? What is its relevance for international competitiveness?

13. How are exchange rates determined under the gold standard?

14. How are trade deficits and trade surpluses automatically eliminated under the gold standard?

PROBLEMS

***1.** From the negatively sloped demand curve and the positively sloped supply curve of a nation's tradeable commodity (i.e., a commodity that is produced at home but is also imported or exported), derive the nation's demand curve of imports of the tradeable commodity for below-equilibrium prices. (*Hint*: See Figure 4.1.)

***2.** For the same given as in Problem 1, derive the supply curve of exports of the tradeable commodity for above-equilibrium prices.

3. Draw a figure similar to the left-hand panel of Figure 16.2, but with D_M vertical. Explain why $D_€$ would also be vertical.

4. Draw a figure similar to the right-hand panel of Figure 16.2, but with S_X vertical. Explain why $S_€$ would also be vertical.

5. Draw a figure similar to the left-hand panel of Figure 16.2 but with D_M steeper (less elastic) than in Figure 16.2 and explain why $D_€$ would be steeper (less elastic) than in Figure 16.1.

6. Draw a figure similar to the right-hand panel of Figure 16.2 but with S_X steeper (less elastic) than in Figure 16.2 and explain why $S_€$ would be steeper (less elastic) than in Figure 16.1 if D_X is price elastic in the relevant range.

***7.** Explain why S_M and D_X are horizontal for a small nation.

8. Explain why the balance of payments of a small nation always improves with a devaluation or depreciation of its currency.

*= Answer provided at www.wiley.com/college/salvatore.

9. Draw a figure similar to Figure 16.2 but referring to an unstable foreign exchange market.

10. In what way can the United States be said to have a trade problem with Japan?

11. Since the U.S. trade deficit with Japan has not been reduced as a result of the sharp depreciation of the dollar with respect to the yen during the 1990s, can we conclude that the trade or elasticity approach to balance-of-payments adjustment does not work? Explain.

12. Suppose that under the gold standard the price of 1 ounce of gold is set at \$35 by U.S. monetary authorities and at £14 by the U.K. monetary authorities. What is the relationship between the dollar and the pound? What is this called?

13. If to ship any amount of gold between New York and London costs 1 percent of the value of the gold shipped, define the U.S. gold export point or upper limit in the exchange rate between the dollar and the pound (R = \$/£). Why is this so?

14. Define the U.S. gold import point or the lower limit in the exchange rate (R = \$/£). Why is this so?

APPENDIX

In this appendix, Section A16.1 shows graphically the effect of a change in the exchange rate on the domestic-currency price of traded commodities. Section A16.2 presents the formal mathematical derivation of the Marshall–Lerner condition for stability in foreign exchange markets. Finally, Section A16.3 shows graphically how the gold points and international gold flows are determined under the gold standard.

A16.1 The Effect of Exchange Rate Changes on Domestic Prices

We said in Section 16.3 that a depreciation or devaluation of the dollar stimulates the production of import substitutes and exports in the United States and leads to a rise in dollar prices in the United States. This can be shown with Figure 16.7.

In the left panel of Figure 16.7, S'_M is the EMU supply curve of imports to the United States expressed in dollars when the exchange rate is R = \$1/€1, and D'_M is the U.S. demand curve for imports in dollars. With D'_M and S'_M, equilibrium is at point B', with P_M = \$1 and Q_M = 12 billion units per year. When the dollar is devalued or allowed to

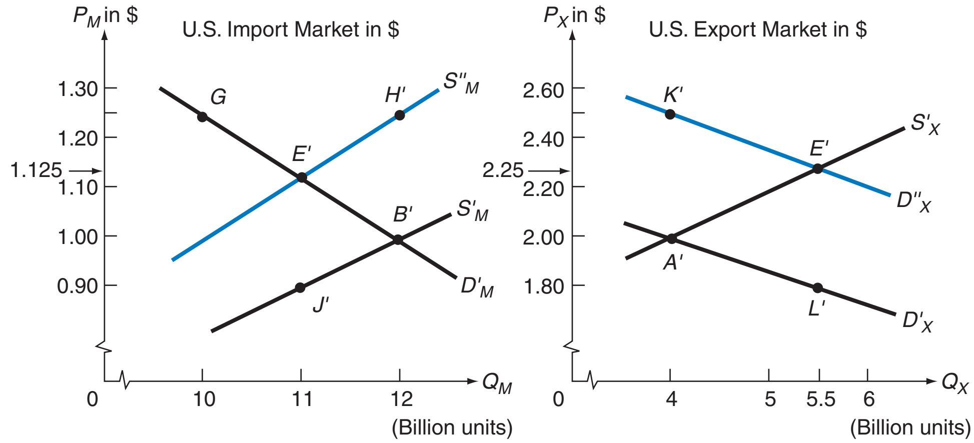

FIGURE 16.7. Effect of a Depreciation or Devaluation on Domestic Prices.
In the left panel, D'_M is the U.S. demand curve of imports in terms of dollars, and S'_M is the EMU supply curve of imports to the United States at $R = \$1/€1$. With D'_M and S'_M, $P_M = \$1$ and $Q_M = 12$ billion units per year. When the dollar depreciates or is devalued by 20 percent, S'_M shifts up to S''_M, but D_M remains unchanged. With D'_M and S''_M, $P_M = \$1.125$ and $Q_M = 11$ billion units.

In the right panel, D'_X is the EMU demand curve of U.S. exports at $R = \$1/€1$, and S'_X is the U.S. supply curve of exports to the EMU, both in terms of dollars. With D'_X and S'_X, $P_X = \$2$ and $Q_X = 4$ billion units per year. When the dollar depreciates or is devalued by 20 percent to $R = \$1.20/€1$, D'_X shifts up to D''_X, but S'_X remains unchanged. With D'_X and S'_X, $P_X = \$2.25$ and $Q_X = 5.5$ billion units. Thus, a depreciation or devaluation increases dollar prices in the United States.

depreciate by 20 percent to $R = \$1.20/€1$, the EMU supply curve of imports to the United States in terms of dollars falls (i.e., shifts up) by 20 percent to S''_M because each dollar that EMU exporters earn in the United States is now worth 20 percent less in terms of euros. This is like a 20 percent-per-unit tax on EMU exporters. Note that S''_M is not parallel to S'_M because the shift is of a constant percentage, and observe that S''_M is used as the base to calculate the 20 percent upward shift from S'_M. Also, D'_M does not change as a result of the depreciation or devaluation of the dollar. With D'_M and S''_M, $P_M = \$1.125$ and $Q_M = 11$ billion (point E). Thus, the dollar price of U.S. imports rises from \$1.00 to \$1.125, or by 12.5 percent, as a result of the 20 percent depreciation or devaluation of the dollar.

In the right panel of Figure 16.8, D'_X is the EMU demand curve for U.S. exports expressed in dollars at $R = \$1/€1$, and S'_X is the U.S. supply curve of exports in terms of dollars. With D'_X and S'_X, equilibrium is at point A', with $P_X = \$2.00$ and $Q_X = 4$ billion units. When the dollar is devalued or allowed to depreciate by 20 percent to $R = \$1.20/€1$, the EMU demand curve for U.S. exports in terms of dollars rises (shifts up) by 20 percent to D'_X because each euro is now worth 20 percent more in terms of dollars. This is like a 20 percent-per-unit subsidy to EMU buyers of U.S. exports. Note that D''_X is not parallel to D'_X because the shift is of a constant percentage, and observe that D''_X is used as the base to calculate the 20 percent upward shift from D'_X. Also, S'_X does not change as a result of the depreciation or devaluation of the dollar. With D''_X and S'_X, $P_X = \$2.25$ and

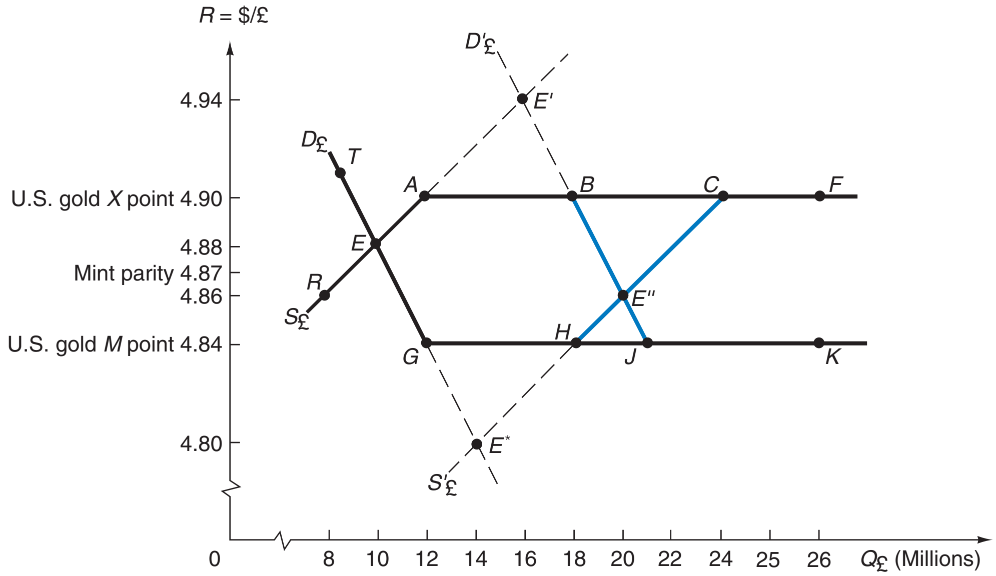

FIGURE 16.8. Gold Points and Gold Flows.
With $D_£$ and $S_£$, the equilibrium exchange rate is $R = \$4.88/£1$ (point E) without any international gold flow, and the U.S. balance of payments is in equilibrium. With $D'_£$ and $S_£$, the exchange rate would be $R = \$4.94$ under a freely flexible exchange rate system, but would be prevented under the gold standard from rising above $R = \$4.90$ (the U.S. gold export point) by U.S. exports of £6 million (AB) of its gold. This represents the U.S. balance-of-payments deficit under the gold standard. With $D_£$ and $S'_£$, the exchange rate would be $R = \$4.80$ under a freely flexible exchange rate system but would be prevented under the gold standard from falling below $R = \$4.84/£1$ (the U.S. gold import point) by U.S. gold imports of £6 million (HG). This represents the U.S. balance-of-payments surplus under the gold standard.

$Q_X = 5.5$ billion units (point E'). Thus, the dollar price of U.S. exports rises from \$2.00 to \$2.25, or by 12.5 percent, as a result of the 20 percent depreciation or devaluation of the dollar.

The rise in the dollar price of import substitutes and exports is necessary to induce U.S. producers to shift production from nontraded to traded goods, but it also reduces the price advantage the United States gained from the depreciation or devaluation. Since the prices of import substitutes and exportable commodities are part of the U.S. general price index, and they both rise, the depreciation or devaluation of the dollar is inflationary for the United States. As a result, the greater the devaluation or depreciation required to correct a deficit of a given size, the less feasible is depreciation or devaluation as a method of correcting the deficit. The elasticity of the demand for and supply of the nation's imports and exports is simply a short-cut indication of the ease or difficulty of shifting domestic resources from nontraded to traded commodities as a result of a devaluation or depreciation of the nation's currency, and of how inflationary the shift will be.

Problem From Figure 16.7, calculate the U.S. terms of trade before and after the 20 percent depreciation or devaluation of the dollar. How do your results compare with those obtained in Section 16.3?

A16.2 Derivation of the Marshall–Lerner Condition

We now derive mathematically the Marshall–Lerner condition that the sum of the elasticities of the demand for imports and the demand for exports must exceed 1 for the foreign exchange market to be stable. This condition holds when the *supply* curves of imports and exports are infinitely elastic, or horizontal.

To derive the Marshall–Lerner condition mathematically, let:

P_X and P_M = foreign currency price of exports and imports, respectively
Q_X and Q_M = the quality of exports and imports, respectively
V_X and V_M = the foreign currency value of exports and imports, respectively

Then the trade balance (B) is

$$B = V_X - V_M = Q_X \cdot P_X - P_M \cdot Q_M \tag{16A-1}$$

For a small devaluation, the change in the trade balance (dB) is

$$dB = P_X \cdot dQ_X + Q_X \cdot dP_X - (P_M \cdot dQ_M + Q_M \cdot dP_M) \tag{16A-2}$$

This was obtained by the product rule of differentials $(duv = v{\cdot}du + u{\cdot}dv)$. Since S_M is horizontal, P_M does not change (i.e., $dP_M = 0$) with a depreciation or devaluation of the dollar, so that the last term in Equation (16A-2) drops out. By then rearranging the first and third terms, we get

$$dB = dQ_X \cdot P_X + Q_X \cdot dP_x - dQ_M \cdot P_M \tag{16A-3}$$

We now define Equation (16A-3) in terms of price elasticities. The price elasticity of the demand for exports (n_X) measures the percentage change in Q_X for a given percentage change in P_X. That is,

$$n_X = -\frac{dQ_X}{Q_X} \div \frac{dP_X}{P_X} = \frac{dQ_X}{Q_X} \div k\left(\frac{P_X}{P_X}\right) = \frac{dQ_X \cdot P_X}{Q_X \cdot k \cdot P_X} \tag{16A-4}$$

where $k = -dP_X/P_X$ (the percentage of depreciation or devaluation of the dollar).

Similarly, the coefficient of price elasticity of the demand for imports (n_M) is

$$n_M = -\frac{dQ_M}{Q_M} - \frac{dP_M}{P_M} = \frac{dQ_M \cdot P_M}{Q_M \cdot k \cdot P_M} \tag{16A-5}$$

From Equation (16A-4), we get

$$dQ_X \cdot P_X = n_X \cdot Q_X \cdot P_X \cdot k \tag{16A-6}$$

This is the first term in Equation (16A-3). We can also rewrite the second term in Equation (16A-3) as

$$Q_X \cdot dP_X = Q_X(dP_X/P_X)P_X = Q_X(-k)P_X = -Q_X \cdot k \cdot P_X \tag{16A-7}$$

Finally, from Equation (16A-5), we get

$$dQ_M \cdot P_M = -n_M \cdot Q_M \cdot dP_M = -n_M \cdot Q_M \cdot P_M \cdot k \tag{16A-8}$$

where $k = dP_M/P_M$. While $dP_M = 0$ in terms of the foreign currency, it is positive in terms of the domestic currency. Equation (16A-8) is the third term in Equation (16A-3).

Substituting Equations (16A-6), (16A-7), and (16A-8) into Equation (16A-3), we get

$$dB = n_X \cdot Q_X \cdot P_X \cdot k - Q_X \cdot P_X \cdot k - (-n_M \cdot Q_M \cdot P_M \cdot k) \tag{16A-9}$$

Simplifying algebraically, we get

$$dB = k[Q_X \cdot P_X(n_X - 1) + n_M \cdot Q_M \cdot P_M] \tag{16A-10}$$

If to begin with

$$B = Q_X \cdot P_X - Q_M \cdot P_M = 0 \tag{16A-11}$$

then

$$dB = k[Q_X \cdot P_X(n_X + n_M - 1)] \tag{16A-12}$$

and $dB > 0$ if

$$n_X + n_M - 1 > 0 \text{ or } n_X + n_M > 1 \tag{16A-13}$$

where both n_X and n_M are positive.

If the devaluation or depreciation takes place from the condition of $V_M > V_X$, n_M should be given a proportionately greater weight than n_X, and the Marshall–Lerner condition for a stable foreign exchange market becomes more easily satisfied and is given by

$$n_X + (V_M/V_X)n_M > 1 \tag{16A-14}$$

If the price elasticities of the foreign supply of the United States imports (e_M) and the United States supply of exports (e_X) are not infinite, then the smaller are e_M and e_X, the more likely it is that the foreign exchange market is stable even if

$$n_X + n_M < 1 \tag{16A-15}$$

The Marshall–Lerner condition for stability of the foreign exchange market when e_M and e_X are not infinite is given by

$$\frac{e_X(n_X - 1)}{e_X + n_X} + \frac{n_M(e_M + 1)}{e_M + n_M} \tag{16A-16}$$

or combining the two components of the expression over a common denominator:

$$\frac{e_M e_X(n_M + n_X - 1) + n_M \cdot n_X(e_M + e_X + 1)}{(e_x + n_X)(e_M + n_M)} \tag{16A-17}$$

The foreign exchange market is stable, unstable, or remains unchanged as a result of a depreciation or devaluation to the extent that Equation (16A-16) or (16A-17) is larger than, smaller than, or equal to 0, respectively. The mathematical derivation of Equation (16A-16) is given in *Stern* (1973).

The condition for a deterioration in the terms of trade of the devaluing nation is also derived in Stern and is given by

$$e_X \cdot e_M > n_X \cdot n_M \tag{16A-18}$$

If the direction of the inequality sign in Equation (16A-18) is the reverse, the devaluing country's terms of trade improve, and if the two sides are equal, the terms of trade remain unchanged.

Problem Explain why a depreciation or devaluation of a small country's national currency is not likely to affect its terms of trade. (*Hint*: Refer to the statement of Problem 9.)

A16.3 Derivation of the Gold Points and Gold Flows under the Gold Standard

Figure 16.8 shows graphically how the gold points and international gold flows are determined under the gold standard. In the figure, the mint parity is \$4.87 = £1 (as defined in Section 16.6A). The U.S. supply curve of pounds ($S_£$) is given by *REABCF* and becomes infinitely elastic, or horizontal, at the U.S. gold export point of \$4.90 = £1 (the mint parity plus the 3 cents cost to ship £1 worth of gold from New York to London). The U.S. demand curve of pounds ($D_£$) is given by *TEGHJK* and becomes infinitely elastic, or horizontal, at the U.S. gold import point of \$4.84 = £1 (the mint parity minus the 3 cents cost to ship £1 worth of gold from London to New York). Since $S_£$ and $D_£$ intersect at point E within the gold points, the equilibrium exchange rate is R = \$4.88/£1 without any international gold flow (i.e., the U.S. balance of payments is in equilibrium).

If subsequently the U.S. demand for pounds increases (shifts up) to $D'_£$, there is a tendency for the exchange rate to rise to R = \$4.94/£1 (point E' in the figure). However, because no one would pay more than \$4.90 for each pound under the gold standard (i.e., the U.S. supply curve of pounds becomes horizontal at R = \$4.90/£1), the exchange rate only rises to R = \$4.90/£1, and the United States will be at point B. At point B, the U.S. quantity demanded of pounds is £18 million, of which £12 million (point A) are supplied from U.S. exports of goods and services to the United Kingdom and the remaining £6 million (AB) are supplied by U.S. gold exports to the United Kingdom (and represent the U.S. balance-of-payments deficit).

If, on the other hand, the U.S. demand curve of pounds does not shift but continues to be given by $D_£$, while the U.S. supply of pounds increases (shifts to the right) to $S'_£$, equilibrium would be at point E^* (at the exchange rate of R = \$4.80/£1) under a flexible exchange rate system. However, since no one would accept less than \$4.84/£1 under the gold standard (i.e., the U.S. demand curve of pounds becomes horizontal at R = \$4.84/£1), the exchange rate falls only to R = \$4.84/£1, and the United States will be at point H. At point H, the U.S. quantity supplied of pounds is £18 million, but the U.S. quantity demanded of pounds is only £12 million (point G). The excess of £6 million *(HG)* supplied to the United States takes the form of gold imports from the United Kingdom and represents the U.S. balance-of-payments surplus.

The operation of the price-specie-flow mechanism under the gold standard would then cause $D_£$ and $S_£$ to shift so as to intersect once again within the gold points, thus automatically correcting the balance-of-payments disequilibrium of both nations.

Problem Determine from Figure 16.8 the exchange rate and the size of the deficit or surplus in the U.S. balance of payments under the gold standard and under a flexible exchange rate system if $D_£$ shifts to $D'_£$, and $S_£$ shifts to $S'_£$ at the same time.

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INTERNet

Data on exchange rates (daily, monthly, and trade-weighted average from 1971 or 1973) for the United States and the world's most important currencies, as well as data on current account balances, that can be used to find the effect of exchange rate changes on the trade and current account balances of the United States and other nations are found on the Federal Reserve Bank of St. Louis web site at:

http://research.stlouisfed.org/fred2

Some recent studies on the effect of international trade and finance on the U.S. economy are found on the web site of the Institute for International Economics and the Council of Foreign Relations at:

http://www.iie.com

http://www.cfr.org

Data to examine the effect of changes in the trade and current account balances on the economy of the United States are found on the Bureau of Economic Analysis and the Federal Reserve Bank of St. Louis websites, respectively, at:

http://bea.gov

http://www.stls.frb.org

Trade data to examine the economic impact of a change in the trade and current account balances on the economics of the European Monetary Union and Japan are found on the web sites of their central banks, respectively, at:

http://ecb.int/home/html/index.en.html

http://www.boj.or.jp/en/index.htm

Data for measuring the effect of exchange rate changes on trade and current account balances and inflation in Latin American and Asian countries are found on the web sites of the Inter-American Development Bank and the Asian Development Bank, respectively, at:

http://www.iadb.org

http://www.adb.org

The Income Adjustment Mechanism and Synthesis of Automatic Adjustments

chapter 17

LEARNING GOALS:

After reading this chapter, you should be able to:

- Understand how the equilibrium level of income is determined in an open economy
- Understand the meaning of foreign repercussions
- Describe how the absorption approach works
- Understand how all the automatic adjustments work together in open economies

17.1 Introduction

In this chapter, we begin by examining the operation of the *automatic income adjustment mechanism*. This relies on induced changes in the level of national *income* of the deficit and the surplus nations to bring about adjustment in the balance of payments. The automatic income adjustment mechanism represents the application of Keynesian economics to open economies (i.e., to nations engaging in international transactions). This is distinguished from the traditional or classical adjustment mechanism (presented in Chapter 16), which relied on automatic price changes to bring about adjustment in the balance of payments.

As in Chapter 16, we assume here that the deficit or surplus arises in the current account of the nation. However, while we implicitly assumed in Chapter 16 that national income remained constant and adjustment was brought about by automatic price changes, we now assume that all prices remain constant and we examine how automatic income changes lead to balance-of-payments adjustment. Specifically, in order to isolate the automatic income adjustment mechanism, we begin by assuming that the nation operates under a fixed exchange rate system and that all prices, wages, and interest rates are constant. We also assume initially that nations operate at less than full employment. In the real world, balance-of-payments disequilibria not only affect national incomes but also exert pressure on exchange rates, prices, wages, and interest rates. Thus, to some extent, all automatic adjustments are likely to operate simultaneously. Such a synthesis is presented in the last two sections of this chapter.

In Section 17.2, we review (from principles of economics) the concept and the determination of the equilibrium national income and the multiplier in a closed economy. In Section 17.3, we extend the concept and examine the determination of the equilibrium level of national income and multiplier in a small open economy. Section 17.4 further extends the presentation to include foreign repercussions that arise when the nations are not small. Foreign repercussions arise because any change in a large nation's level of national income and trade affects the national income and trade of the partner, and these in turn have secondary effects (repercussions) on the first nation. Indeed, this is how business cycles are transmitted internationally. Section 17.5 examines the price and income adjustment mechanisms together. Finally, Section 17.6 discusses monetary adjustments and presents a synthesis of all automatic adjustments, pointing out the disadvantages of each automatic mechanism and the need for adjustment policies. In the appendix, we present the mathematical derivation of the foreign trade multipliers with foreign repercussions, and then we examine the transfer problem (building on the discussion in the appendix to Chapter 12).

17.2 Income Determination in a Closed Economy

In this section, we review the concept and determination of the equilibrium national income and the multiplier in a closed economy (i.e., an economy in autarky or without international trade). These concepts were covered in your principles of economics course and represent our point of departure for examining the equilibrium level of national income and the multiplier in a small open economy (in Section 17.3). Since in this chapter we examine the operation of the *automatic* income adjustment mechanism, we do not need to include the government sector in our model. The government sector will be added to our model in the next chapter, which deals with fiscal and other policies.

17.2A Determination of the Equilibrium National Income in a Closed Economy

In a closed economy without a government sector, the equilibrium level of national income and production (Y) is equal to the desired or planned flow of consumption (C) plus desired or planned investment expenditures (I), as indicated in Equation (17-1):

$$Y = C(Y) + I \tag{17-1}$$

Desired or planned investment (I) is *autonomous*, or independent of (i.e., it does not change with) the level of national income. On the other hand, desired consumption expenditures, $C(Y)$, are a function of, or depend on, the level of national income. That is, as income (Y) rises, desired consumption (C) also rises. The change in consumption (ΔC) associated with a change in income (ΔY) is called the marginal propensity to consume (MPC). Since consumers save part of their income, the increase in consumption is less than the increase in income so that $MPC < 1$. This is illustrated in Figure 17.1.

The top panel of Figure 17.1 measures consumption and investment expenditures along the vertical axis and national income along the horizontal axis. The consumption function is shown by line $C(Y)$. Desired consumption equals 100 when income is zero and rises as income rises. The positive level of consumption when income is zero indicates that the

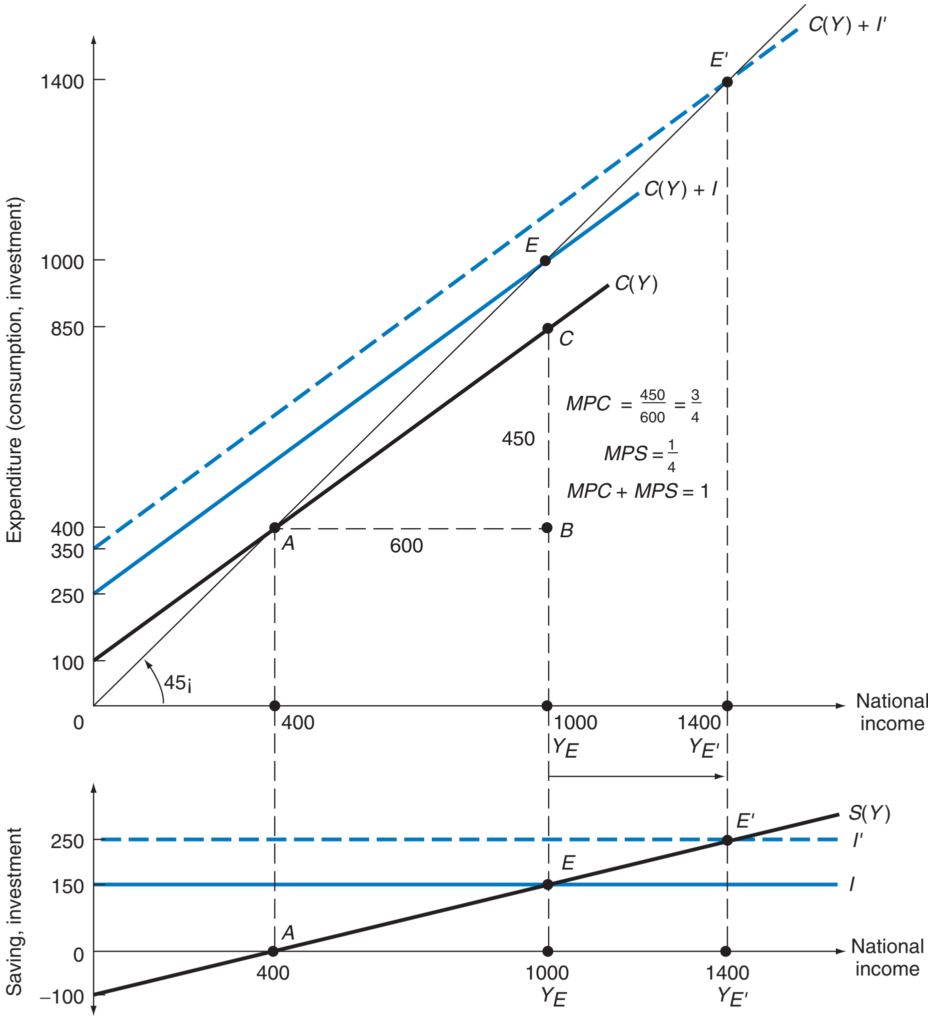

FIGURE 17.1. National Income Equilibrium in a Closed Economy.
In the top panel, $C(Y)$ is the consumption function and $C(Y) + I$ is the total expenditure function obtained by adding desired investment to the consumption function. The equilibrium level of national income is at point E, where the $C(Y) + I$ function crosses the 45° line. In the bottom panel, equilibrium is given by point E, where the saving function $S(Y)$ intersects the horizontal investment function. In both panels, the equilibrium level of income is 1000. If investment rises to $I' = 250$, the new equilibrium level of national income is 1400, given by point E', where broken-line $C(Y) + I'$ crosses the 45° line or where broken-line I' crosses $S(Y)$.

nation lives off its past savings, or dissaves. Then as income rises, desired consumption rises but by less than the rise in income. For example, an increase in income of 600 (from 400 to 1000, given by AB in the top panel) is associated with an increase in consumption of 450 (BC). Thus, the marginal propensity to consume, or MPC, equals $\Delta C/\Delta Y = 450/600 = 3/4$, or 0.75. The equation of this linear consumption function is then $C = 100 + 0.75Y$, where 100 is the vertical intercept and 0.75 is the slope.

Adding to the consumption function a hypothetical desired investment expenditure of 150 at every level of income, we get the total expenditure function $C(Y) + I$ in the figure. The $C(Y) + I$ function crosses the 45° line at point E. Every point on the 45° line measures equal distances along the vertical and horizontal axes. Thus, at point E, the total of consumption and investment expenditures of 1000 (measured along the vertical axis) equals the level of production or income of 1000 (measured along the horizontal axis). $Y_E = 1000$ is then the equilibrium level of national income.

At $Y > 1000$, desired expenditures fall short of output, firms have an *unplanned* accumulation of inventories of unsold goods, and they cut production. On the other hand, at $Y < 1000$, desired expenditures exceed production, there is an unplanned reduction of inventories, and production is increased. Thus, the equilibrium level of national income $Y_E = 1000$ is stable in the sense that at any other level of national income, desired expenditures either exceed or fall short of the value of output, and the level of national income moves toward $Y_E = 1000$. The equilibrium level of income need not be, and we assume that it is not, the full-employment level of income (Y_F).

In the bottom panel of Figure 17.1, the vertical axis measures the level of saving and investment, and the horizontal axis measures the level of national income (as in the top panel). The level of desired investment is autonomous at $I = 150$ regardless of the level of income. On the other hand, desired saving is a function of income, so that the saving function is

$$S(Y) = Y - C(Y) \tag{17-2}$$

Thus, when $Y = 0$, $C = 100$ (see the top panel) and $S = -100$ (in the bottom panel). At $Y = 400$, $C = 400$ and $S = 0$ (point A in both panels). At $Y = 1000$, $C = 850$ and $S = 150$. Note that as income rises, desired saving rises. The change in desired saving (ΔS) associated with a change in income (ΔY) is defined as the marginal propensity to save (MPS). For example, an increase in income of 600 (from 400 to 1000) is associated with an increase in saving of 150 in the bottom panel. Thus, the marginal propensity to save, or MPS, equals $\Delta S/\Delta Y = 150/600 = 1/4$. Since any change in income (ΔY) always equals the change in consumption (ΔC) plus the change in saving (ΔS), $MPC + MPS = 1$, so that $MPS = 1 - MPC$. In the above example, $MPC + MPS = 3/4 + 1/4 = 1$, and $MPS = 1 - 3/4 = 1/4$.

In the bottom panel, the desired investment of 150 (an injection into the system) equals desired saving (a leakage out of the system) at $Y = 1000$. Investment is an injection into the system because it adds to total expenditures and stimulates production. Saving is a leakage out of the system because it represents income generated but not spent. The equilibrium level of income is the one at which

$$S = I \tag{17-3}$$

Graphically, the equilibrium level of income is given at the intersection of the saving function and the investment function at point E. At $Y > 1000$, the excess of desired saving over desired investment represents an unintended or unplanned inventory investment. Thus, production and income fall toward $Y_E = 1000$. On the other hand, at $Y < 1000$, the excess of desired investment over desired saving represents an unintended or unplanned inventory disinvestment, and income and production rise toward $Y_E = 1000$.

Thus, the equilibrium level of national income is determined either at the intersection of the $C(Y) + I$ function with the 45° line in the top panel or by the intersection of the $S(Y)$

and I functions in the bottom panel. In either case, the equilibrium level of national income is $Y_E = 1000$, and we assume that it is smaller than the full-employment level of income.

17.2B Multiplier in a Closed Economy

If, for whatever reason, investment rises by 100 from $I = 150$ to $I' = 250$, the total expenditure function shifts up by 100 from $C(Y) + I$ to $C(Y) + I'$ (the broken line in the top panel of Figure 17.1) and defines equilibrium point E' at $Y'_E = 1400$. Equivalently, an autonomous increase in investment causes the investment function to shift up from $I = 150$ to $I' = 250$ (the broken line in the bottom panel) and intersect the saving function at point E', also defining the equilibrium level of national income at $Y'_E = 1400$.

Starting from the original equilibrium point E in the bottom panel, as investment increases from $I = 150$ to $I' = 250$, $I' > S$ and Y rises. The rise in Y induces S to rise. This continues until Y has risen sufficiently for induced S to equal the new and higher level of I'. For this to occur, Y must rise by 400, from $Y_E = 1000$ to $Y'_E = 1400$, as indicated by the new equilibrium point of E' in the bottom (and top) panel(s).

Thus, an increase in I of 100 results in an increase in Y of 400 in order to induce S to also rise by 100 and reach another equilibrium point. That is,

$$\Delta I = \Delta S = MPS \times \Delta Y$$

so that

$$\Delta Y = \left(\frac{1}{MPS}\right) \Delta I$$

Therefore, the multiplier (k) is

$$k = \frac{\Delta Y}{\Delta I} = \frac{1}{MPS} = \frac{1}{1 - MPC} \tag{17-4}$$

That is, the closed economy Keynesian multiplier (k) is equal to the inverse, or reciprocal, of the marginal propensity to save or to the reciprocal of 1 minus the marginal propensity to consume. Since $0 < MPS < 1$, the multiplier is larger than 1. For example, in Figure 17.1, $MPS = 1/4$ and $k = 4$, so that the increase in I of 100 leads to an increase in Y of 400 and an induced rise in S also equal to 100.

The reason income rises more than investment is as follows. When investment expenditures rise, producers expand production, hire more workers, use more capital and other factors of production. Since the income generated in the process of production equals the value of the output produced, increasing investment expenditures by 100 has the immediate effect of also increasing income by the same amount. But the recipients of this 100 increase in income will spend $3/4$ (the MPC) of it. Thus, as incomes rise by 100, consumption expenditures rise by 75. This leads to a further expansion of production and generates an additional income of 75. This new increase in income leads to a further increase in consumption of 56.25 (from 0.75×75).

The process continues, with income rising by smaller and smaller amounts at every step, until the increase in income becomes zero. Thus, income increases by 100 in the first step, by 75 in the second step, by 56.25 in the third step, and so on, until the *sum total* of all the increases in income is 400. When income has risen by 400, from $Y_E = 1000$ to $Y'_E = 1400$, induced saving will have risen by 100, and once again $S = I' = 250$, and the process comes to an end.

17.3 Income Determination in a Small Open Economy

We now extend the discussion of the equilibrium level of national income and the multiplier from a closed economy to a small open economy (i.e., an economy whose international transactions do not perceptibly affect the national income of its trade partner or the rest of the world). We begin by defining the import function of the nation; then we show how the equilibrium level of national income is determined algebraically and graphically; finally, we derive the foreign trade multiplier. In Section 17.4, we will relax the assumption that the nation is small and extend the discussion to consider foreign repercussions. For simplicity, we continue to assume that there is no government sector and that the economy operates at less than full employment.

17.3A Import Function

The import function of a nation, $M(Y)$, shows the relationship between the nation's imports and national income. A hypothetical import function is shown in Figure 17.2. Note that $M = 150$ when $Y = 0$ and rises as Y rises. When income is zero, the nation purchases 150 of imports by borrowing abroad or with its international reserves. Then as income rises, imports also rise.

The change in imports (ΔM) associated with a change in income (ΔY) is called the marginal propensity to import (MPM). For example, a movement from point G to point H on the import function in Figure 17.2 involves an increase in imports from $M = 300$ to $M = 450$ for an increase in income from $Y = 1000$ to $Y = 2000$. Thus, $MPM = \Delta M/\Delta Y = 150/1000 = 0.15$. The MPM is equal to the slope of $M(Y)$ and is constant. On the other hand, the ratio of imports to income is called the average propensity to import (APM) and falls as

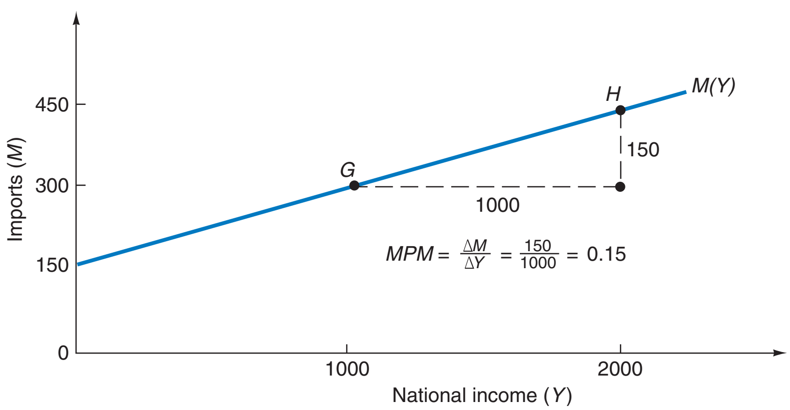

FIGURE 17.2. The Import Function.
Import function $M(Y)$ shows that imports are 150 when income is zero and rise as income rises. The slope of the import function (the change in imports resulting from a given change in income) is called the marginal propensity to import (MPM). For the import function shown here, $MPM = \Delta M/\Delta Y = 0.15$ and remains constant.

income rises (if the import function has a positive vertical intercept, as in Figure 17.2). Thus, at point G, $APM = M/Y = 300/1000 = 0.3$, while at point H, $APM = M/Y = 450/2000 = 0.225$. Then MPM/APM is the income elasticity of imports (n_Y). Specifically:

$$n_Y = \frac{\text{percentage change in imports}}{\text{percentage change in income}} = \frac{\Delta M/M}{\Delta Y/Y} = \frac{\Delta M/\Delta Y}{M/Y} = \frac{MPM}{APM} \tag{17-5}$$

For the movement from point G to point H in Figure 17.2:

$$n_Y = \frac{150/1000}{300/1000} = \frac{0.15}{0.30} = 0.5$$

Being very large and well endowed with resources, the United States is less dependent on international trade and thus tends to have a smaller APM and MPM than most other nations. For example, for the United States, $APM = 0.15$ and $MPM = 0.27$, so that $n_Y = 1.8$ in the long run; for Germany, $APM = 0.33$, $MPM = 0.50$, so that $n_y = 1.5$; for the United Kingdom, $APM = 0.29$, $MPM = 0.64$, so that $n_y = 2.2$. Only for Japan among the G-7 countries are the APM and the MPM smaller than in the United States. Case Study 17-1 demonstrates the income elasticity of imports for the United States and other countries or groups of countries.

CASE STUDY 17-1 Income Elasticity of Imports

Table 17.1 gives the values of the income elasticity of imports of goods and services for the United States, Japan, Germany, France, the United Kingdom, Italy, and Canada calculated from the same data set used to estimate price elasticities in Table 16.3. From Table 17.1, we see that the income elasticity of imports ranges from 1.4 to 1.8 for the United States, Germany, France, Italy, and Canada. It is 2.2 for the United Kingdom and 0.9 for Japan. The low income elasticity of imports for Japan means that the MPM is smaller than the APM in Japan, whereas the opposite is true for the other industrial countries. This is because Japan imports proportionately more raw materials and spends proportionately more of the increase in its income on domestic products rather than on imports as compared with other industrial countries.

TABLE 17.1. Income Elasticity of Imports

Country/Group of Countries	Elasticities
United States	1.8
Japan	0.9
Germany	1.5
France	1.6
United Kingdom	2.2
Italy	1.4
Canada	1.4

Source: Hooper, Johnson, and Marquez (2008).

17.3B Determination of the Equilibrium National Income in a Small Open Economy

The analysis of the determination of the equilibrium national income in a closed economy can easily be extended to include foreign trade. In an open economy, exports, just like investment, are an injection into the nation's income stream, while imports, just like saving, represent a leakage out of the income stream. Specifically, exports as well as investment stimulate domestic production, while imports as well as saving constitute income earned but not spent on domestic output.

For a small open economy, exports are also taken to be *autonomous* or independent of the level of income of the nation (just like investment). Thus, the export function is also horizontal when plotted against income. That is, the exports of the nation are the imports of the trade partner or the rest of the world and, as such, depend not on the exporting nation's level of income but on the level of income of the trade partner or the rest of the world. On the other hand, imports (like saving) are a function of the nation's income. With this in mind, we can now proceed to specify the condition for the equilibrium level of national income for a small open economy.

In a small open economy, the equilibrium condition relating injections and leakages in the income stream is

$$I + X = S + M \tag{17-6}$$

Note that this condition for the equilibrium level of national income does not imply that the balance of trade (and payments) is in equilibrium. Only if $S = I$ will $X = M$, and the balance of trade will also be in equilibrium.

By rearranging the terms of Equation (17-6), we can restate the condition for the equilibrium level of national income as

$$X - M = S - I \tag{17-7}$$

This points out that at the equilibrium level of national income, the nation could have a surplus in its trade balance (a net injection from abroad) equal to the excess of saving over domestic investment (a net domestic leakage). On the other hand, a deficit in the nation's trade balance must be accompanied by an equal excess of domestic investment over saving at the equilibrium level of national income.

By transposing I from the right to the left side of Equation (17-7), we get still another useful and equivalent form of the equilibrium condition:

$$I + (X - M) = S \tag{17-8}$$

The expression $(X - M)$ in Equation (17-8) refers to net foreign investment, since an export surplus represents an accumulation of foreign assets. Thus, Equation (17-8) indicates that at the equilibrium level of national income, domestic investment plus net foreign investment equals domestic saving (see Case Study 17-2). If imports exceed exports, the term $(X - M)$ is negative so that domestic investment exceeds domestic saving by the amount of net foreign disinvestment (i.e., the amount by which foreigners are investing in the nation).

CASE STUDY 17-2 Private Sector and Current Account Balances

Table 17.2 shows the average private-sector balance (S-I) and the trade or current account balance (X-M) as a percentage of gross domestic product (GDP) of the leading (G-7) industrial countries over the 1996–2000 period and their values in 2001. The table shows that, as a percentage of GDP, the United States had the largest private sector and current account deficits, while Japan had the largest private sector and current account surpluses (only Canada in 2001 had a higher current account surplus than Japan). The equilibrium condition in Equation (17-7) $(X - M = S - I)$ does not hold because of the missing government sector (discussed in the next chapter).

TABLE 17.2. Private Sector and Current Account Balances in the G-7 Countries, 1996–2001

Country	Private Sector Balances: 1996–2000 Average	Private Sector Balances: 2001	Current Account Balances: 1996–2000 Average	Current Account Balances: 2001
United States	−2.7	−4.7	−2.7	−4.1
Japan	7.9	8.5	2.3	2.1
Germany	1.2	1.8	−0.6	−0.7
United Kingdom	−0.6	−2.9	−1.2	−1.8
France	4.7	3.0	2.2	1.6
Italy	4.6	1.5	1.6	0.1
Canada	−0.4	0.9	0.1	3.7

Source: Organization for Economic Cooperation and Development, *Economic Outlook* (Paris: OECD, December 2001), p. 134.

17.3c Graphical Determination of the Equilibrium National Income

The above algebraic statement of the equilibrium level of national income in a small open economy is shown graphically and clarified in Figure 17.3. The top panel of Figure 17.3 represents the determination of the equilibrium level of national income in terms of Equation (17-6), while the bottom panel determines the equilibrium level of national income in terms of Equation (17-7). Exports are autonomous and are assumed to be equal to 300, and $Y_E = 1000$ in both panels. Specifically, the top panel measures investment plus exports and saving plus imports on the vertical axis, and national income along the horizontal axis. With investment of $I = 150$ (as in Figure 17.1) and exports of $X = 300$, the investment plus exports function is $I + X = 150 + 300 = 450$. The saving plus imports function, $S(Y) + M(Y)$, is obtained by the vertical addition of the import function of Figure 17.2 to the saving function of Figure 17.1. For example, at $Y = 0$, $S = -100$ and $M = 150$, so that $S + M = -100 + 150 = +50$. At $Y = 1000$, $S + M = 150 + 300 = 450$. Note that the slope of the saving plus imports function is equal to the *MPS* (the slope of the saving function) plus the *MPM* (the slope of the import function). That is, the slope of $S(Y) + M(Y) = MPS + MPM = 0.25 + 0.15 = 0.40$.

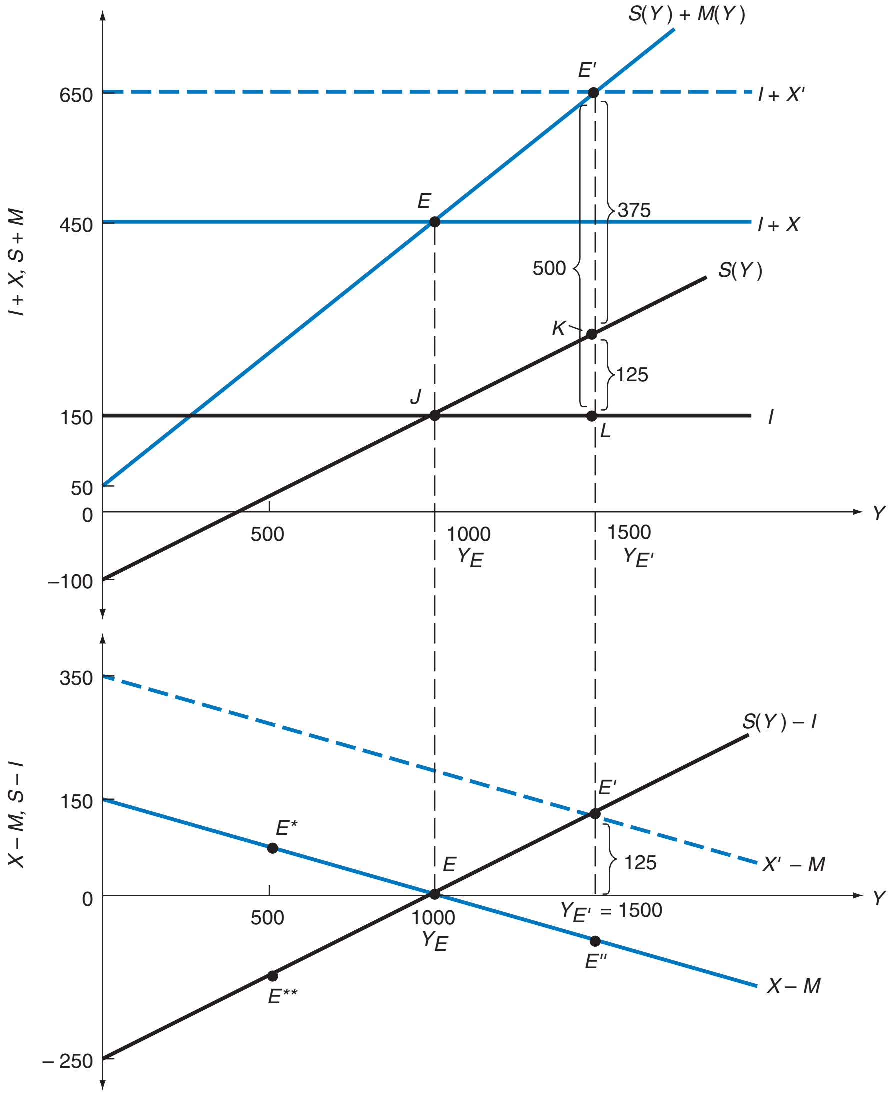

FIGURE 17.3. National Income Determination in a Small Open Economy.
The top panel measures saving plus imports and investment plus exports on the vertical axis and national income along the horizontal axis. The equilibrium level of national income is $Y_E = 1000$ and is determined at point E, where the $I + X$ function crosses the $S(Y) + M(Y)$ function. At $Y_E = 1000$, $S = I = 150$ so that $X = M = 300$. The bottom panel measures $(X - M)$ and $(S - I)$ on the vertical axis and Y on the horizontal axis. The $X - M(Y)$ function falls because we subtract rising M from a constant X as Y rises. The $S(Y) - I$ function rises because we subtract a constant I from rising S as Y rises. $Y_E = 1000$ and is determined at point E, where the $X - M(Y)$ function crosses the $S(Y) - I$ function and $X - M = S - I = 0$. An autonomous increase in X of 200 (broken-line $I + X'$ in the top panel and $X' - M(Y)$ in the bottom panel) results in $Y_{E'} = 1500$ and $X' - M = 125$ and $S - I = 125$.

The equilibrium level of national income is $Y_E = 1000$ and is determined where the *(I + X)* function crosses the *S(Y) + M(Y)* function (point *E* in the top panel). That is, equilibrium is determined where

$$\begin{aligned} \text{INJECTIONS} &= \text{LEAKAGES} \\ I + X &= S + M \\ 150 + 300 &= 150 + 300 \\ 450 &= 450 \end{aligned}$$

Note that in this case, $I = S = 150$ so that $X = M = 300$ (*EJ* in the figure). Thus, the trade balance is also in equilibrium at the equilibrium level of national income of $Y_E = 1000$. Y_E is also stable in the sense that if injections did not equal leakages, the economy would automatically gravitate toward Y_E.

The bottom panel of Figure 17.3 measures $(X - M)$ and $(S - I)$ on the vertical axis, and Y along the horizontal axis. Since $X = 300$ and $M = 150$ at $Y = 0$, $X - M = 300 - 150 = 150$ at $Y = 0$. The $X - M(Y)$ function declines because we subtract rising M from a constant X as Y rises. That is, the balance of trade deteriorates as Y rises. On the other hand, since $S = -100$ at $Y = 0$ and $I = 150$, $S - I = -100 - 150 = -250$ at $Y = 0$. The $S(Y) - I$ function rises because we subtract a constant I from rising S as Y rises. The equilibrium level of national income is $Y_E = 1000$ (as in the top panel) and is determined where the $X - M(Y)$ function crosses the $S(Y) - I$ function (point E in the bottom panel).

The advantage of using the bottom panel (and Equation (17-7)) is that the trade balance can be read directly from the figure. Since the $X - M(Y)$ function crosses the $S(Y) - I$ function on the horizontal axis, $X - M = S - I = 0$ at $Y_E = 1000$. That is, the trade balance happens to be in equilibrium at the equilibrium level of national income. This is a convenient point of departure to analyze how a disturbance (such as an autonomous change in exports or investment) affects the nation's equilibrium level of income and the operation of the automatic income adjustment mechanism.

17.3D Foreign Trade Multiplier

Starting from the equilibrium point *E* in the top and bottom panels of Figure 17.3, an autonomous change in exports or investment (the left side of Equation (17-6)) disturbs the nation's equilibrium level of income. The change in the equilibrium level of national income then induces changes in the amount of saving and imports (the right side of Equation (17-6)) until the sum of the induced changes in saving and imports equals the sum of the autonomous changes in investment and exports. That is, another equilibrium level of national income is determined where

$$\Delta I + \Delta X = \Delta S + \Delta M \tag{17-9}$$

The *induced* changes in saving and imports when income changes are given by

$$\begin{aligned} \Delta S &= (MPS)(\Delta Y) \\ \Delta M &= (MPM)(\Delta Y) \end{aligned}$$

Substituting these for ΔS and ΔM in Equation (17-9), we get

$$\Delta I + \Delta X = (MPS)(\Delta Y) + (MPM)(\Delta Y)$$

$$\Delta I + \Delta X = (MPS + MPM)(\Delta Y)$$

$$\Delta Y = \frac{1}{MPS + MPM}(\Delta I + \Delta X)$$

where the foreign trade multiplier (k') is

$$k' = \frac{1}{MPS + MPM} \qquad (17\text{-}10)$$

For example, starting from equilibrium point E in Figure 17.3, if exports rise autonomously by 200 from $X = 300$ to $X' = 500$,

$$k' = \frac{1}{MPS + MPM} = \frac{1}{0.25 + 0.15} = \frac{1}{0.40} = 2.5$$

$$\Delta Y = (\Delta X)(k') = (200)(2.5) = 500$$

$$Y_{E'} = Y_E + \Delta Y = 1000 + 500 = 1500$$

$$\Delta S = (MPS)(\Delta Y) = (0.25)(500) = 125$$

$$\Delta M = (MPM)(\Delta Y) = (0.15)(500) = 75$$

Therefore, at $Y_{E'}$,

CHANGE IN INJECTIONS = CHANGE IN LEAKAGES

$$\Delta I + \Delta X = \Delta S + \Delta M$$

$$0 + 200 = 125 + 75$$

$$200 = 200$$

At the new equilibrium level of national income of $Y_{E'} = 1500$, exports exceed imports by 125 per period. That is, the automatic change in income induces imports to rise by less than the autonomous increase in exports, so that the adjustment in the balance of payments is incomplete. The foreign trade multiplier $k' = 2.5$ found above is smaller than the corresponding closed economy multiplier $k = 4$ found in Section 17.2B because in an open economy, domestic income leaks into both saving and imports. This is a fundamental result of open-economy macroeconomics.

In the top panel of Figure 17.3, the new higher (broken-line) $I + X'$ function crosses the unchanged $S(Y) + M(Y)$ function at point E'. At $Y_{E'} = 1500$, $X' = 500(E'L)$ and $M = 375(E'K)$ so that $X' - M = 125(KL)$. The same outcome is shown in the bottom panel of Figure 17.3 by point E', where the new and higher (broken-line) $X' - M(Y)$ function crosses the unchanged $S(Y) - I$ function at $Y_{E'} = 1500$ and defines the trade surplus of $X' - M = 125$.

Note that the smaller $MPS + MPM$ is, the flatter is the $S(Y) + M(Y)$ function in the top panel of Figure 17.3, and the larger would be the foreign trade multiplier and the increase

CASE STUDY 17-3 Growth in the United States and the World and U.S. Current Account Deficits

Table 17.3 shows the growth of real GDP in the United States and in the world as a whole, and their effect on the U.S. current account (CA) balance and on the ratio of the U.S. current account balance to the U.S. GDP (i.e., CA/GDP) from 1994 to 2011. Because we are interested in the *sustainability* of the U.S. current account deficit over time, we will concentrate on changes in the value of CA/GDP rather than the absolute value of the U.S. current account deficits.

The table shows that the U.S. CA/GDP worsened from 2004 to 2006 and from 2010 to 2011 as U.S. growth declined (the opposite of what we would expect), but (as expected) it improved from 2007 to 2009 as U.S. growth declined. This only points to the fact that the U.S. CA/GDP depends on the interaction of many economic forces (such as growth in the rest of the world, changes in the dollar exchange rate, relative inflation rates, and not just on U.S. growth), which often pull in opposite directions (as examined in the rest of this chapter and in Chapter 18). Since U.S. current accounts deficits are financed by capital or financial inflows from abroad, the question arises as to the sustainability of the U.S. current accounts deficits over time. A sudden withdrawal or drying up of financial inflows could lead to a sharp depreciation of the dollar and a big increase in U.S. interest rates, which could plunge the United States into a deep recession. Thus, it is important for the United States to reduce and keep its current account deficits to sustainable levels (say in the range of 2 to 3 percent of GDP).

TABLE 17.3. Growth in the United States and the World and the U.S. Current Account Balance, 1994–2011

	Average 1994–2003	2004	2005	2006	2007	2008	2009	2010	2011
Growth of US Real GDP (%)	3.3	3.5	3.1	2.7	1.9	−0.3	−3.5	3.0	1.7
Growth of World Real GDP (%)	3.4	4.9	4.5	5.2	5.4	2.8	−0.6	5.3	3.9
CA Balance of U.S. (billions of dollars)	−279	−630	−748	−803	−718	−669	−378	−470	−473
CA/GDP of U.S.	−3.1	−5.3	−5.9	−6.0	−5.1	−4.7	−2.7	−3.2	−3.1

Source: International Monetary Fund, *International Financial Statistics* (Washington, D.C.: IMF, 2012).

in income for a given autonomous increase in investment and exports. Also to be noted is that Y rises as a result of the autonomous increase in X, and I remains unchanged (i.e., $\Delta I = 0$).

If I instead of X rises by 200,

$$\Delta I + \Delta X = \Delta S + \Delta M$$

$$200 + 0 = 125 + 75$$

and the nation faces a continuous trade deficit of 75, equal to the increase in imports. This could be shown graphically by a downward shift in the $S(Y) - I$ function by 200 so as to

CASE STUDY 17-4 Growth and Current Account Balance in Developing Economies

Table 17.4 shows the growth of real GDP and the current account balance as a percentage of GDP in some of the most important and dynamic developing economies from 2006 to 2011. From the table, we see the very high average growth rate of China, India, Argentina, Singapore, and Indonesia from 2006 to 2011. The table also shows that there seems to be little relationship between the growth of the economy and the nation's current account balance. Some countries, such as China, experienced high growth and a large surplus in its current account; others, such as India, experienced rapid growth and a current account deficit, while still others nations, such as Indonesia, grew very rapidly and their current account was more or less in balance. Conversely, Mexico and the Czech Republic experienced relatively slow growth and current account deficits. This shows, once again, that although domestic and international economic growth affects a nation's current account, there are also other forces (such as exchange rates, relative inflation rates, structural imbalances, etc.) at work.

TABLE 17.4. Growth and Current Account Balances in Some Developing Economies, 2006–2011

	Growth of Real GDP		Current Account Balance as % of GDP	
Economy	Average 2006–2010	2011	Average 2006–2010	2011
Asia				
China	11.2	9.2	7.6	2.8
Hong Kong SAR	4.0	5.0	10.6	4.1
India	8.5	7.2	–1.8	–2.8
Korea	3.8	3.6	2.1	2.4
Singapore	6.5	4.9	21.6	21.9
Taiwan, P.C.	4.2	4.0	8.7	8.8
Indonesia	5.7	6.5	1.7	0.2
Malaysia	4.5	5.1	15.6	11.5
Thailand	3.6	0.1	4.2	3.4
Latin America				
Argentina	6.8	8.9	2.0	–0.5
Brazil	4.4	2.7	–0.8	–2.1
Mexico	1.8	4.0	–0.8	–0.8
Central Europe				
Czech Republic	2.7	1.7	–2.7	–2.9
Poland	4.7	4.3	–5.0	–4.3
Turkey	3.3	8.5	–5.3	–9.9
Russia	3.6	4.3	6.1	5.5
Africa				
South Africa	3.1	3.1	–5.3	–3.3

Source: International Monetary Fund, *International Financial Statistics* (Washington, D.C.: IMF, 2012).

cross the unchanged $X - M(Y)$ function at point E' (see the bottom panel of Figure 17.3) and define $Y_{E''} = 1500$ and $X - M = -75$.

On the other hand, starting from equilibrium point E in the bottom panel of Figure 17.3, an *autonomous* increase of 200 in saving would shift the $S(Y) - I$ function upward by 200 and define (at point E^*) $Y_E{}^* = 500$ and a trade surplus of $X - M = 75$. Finally, an *autonomous* increase in imports of 200 would shift the $X - M(Y)$ function downward by 200 and define equilibrium point E^{**} (see the bottom panel of Figure 17.3), at which $Y^{**} = 500$ and the nation would have a trade deficit of $X - M = -125$. The reduction in the equilibrium level of national income results because imports replace domestic production. Case Study 17-3 examines the relationship between the current account balance and growth in the United States, while Case Study 17-4 does the same for some of the most important developing economies.

17.4 Foreign Repercussions

In this section, we relax the assumption that the nation is small and extend the analysis to consider foreign repercussions. In a two-nation world (Nation 1 and Nation 2), an autonomous increase in the exports of Nation 1 arises from and is equal to the *autonomous increase* in the *imports of Nation 2*. If the autonomous increase in the imports of Nation 2 replaces domestic production, Nation 2's income will fall. This will induce *Nation 2's imports to fall*, thus neutralizing part of the original autonomous increase in its imports. This represents a foreign repercussion on Nation 1 that neutralizes part of the original autonomous increase in its exports. As a result, the foreign trade multiplier for Nation 1 with foreign repercussions is smaller than the corresponding foreign trade multiplier without foreign repercussions, and its trade balance will not improve as much.

Assuming that all of the autonomous increase in the exports of Nation 1 replaces domestic production in Nation 2, *the foreign trade multiplier of Nation 1 with foreign repercussions for an autonomous increase in exports* (k'') is

$$k'' = \frac{\Delta Y_1}{\Delta X_1} = \frac{1}{MPS_1 + MPM_1 + MPM_2(MPS_1/MPS_2)} \tag{17-11}$$

where the subscripts 1 and 2 refer, respectively, to Nation 1 and Nation 2. (This and the following formulas are derived in the appendix.) For example, if $MPS_1 = 0.25$ and $MPM_1 = 0.15$ for Nation 1 (as in Section 17.3), and $MPS_2 = 0.2$ and $MPM_2 = 0.1$ for Nation 2,

$$k'' = \frac{\Delta Y_1}{\Delta X_1} = \frac{1}{0.25 + 0.15 + 0.10(0.25/0.20)} = \frac{1}{0.525} = 1.90$$

Thus, the original autonomous increase of 200 in the exports of Nation 1 leads to an increase in the equilibrium national income of Nation 1 of (200)(1.90) = 380 with foreign repercussions, as compared with (200)(2.5) = 500 without foreign repercussions. As a result, $\Delta M_1 = (\Delta Y_1)(MPM_1) = (380)(0.15) = 57$ and $\Delta S_1 = (\Delta Y_1)(MPS_1) = (380)(0.25) = 95$ with foreign repercussions.

Substituting these values into the equilibrium equation $\Delta I_1 + \Delta X_1 = \Delta S_1 + \Delta M_1$, we get $0 + \Delta X_1 = 95 + 57 = 152$. Therefore, the net increase in X_1 is 152 with foreign repercussions as compared with 200 without. With M_1 rising by 57, Nation 1's trade surplus is $152 - 57 = 95$ with foreign repercussions, as compared with 125 (point E' in Figure 17.3) without.

Starting from the equilibrium level of national income and equilibrium in the trade balance (point E in the bottom panel of Figure 17.3), an autonomous increase in investment in Nation 1 (I_1) causes its income (Y_1) to rise and induces its imports (M_1) to rise also, thus opening a deficit in Nation 1's balance of trade (for example, see equilibrium point E'' in the bottom panel of Figure 17.3). In the absence of foreign repercussions, this is the end of the story. With foreign repercussions, the increase in M_1 is equal to an increase in the exports of Nation 2 (X_2) and induces an increase in Y_2 and M_2. This increase in M_2 is an increase in X_1 (a foreign repercussion on Nation 1) and moderates the original trade deficit of Nation 1.

The *foreign trade multiplier in Nation 1 with foreign repercussions for an autonomous increase in investment (k)** is

$$k^* = \frac{\Delta Y_1}{\Delta I_1} = \frac{1 + MPM_2/MPS_2}{MPS_1 + MPM_1 + MPM_2(MPS_1/MPS_2)} \qquad (17\text{-}12)$$

Since the denominator of Equation (17-12) is identical to the denominator of Equation (17-11), using the same information, we get

$$k^* = \frac{\Delta Y_1}{\Delta I_1} = \frac{1 + 0.10/0.20}{0.525} = \frac{1.50}{0.525} = 2.86$$

Thus, $k^* > k' > k''$ and the autonomous increase in I_1 of 200 causes Y_1 to rise by (200)(2.86) = 572, instead of 500 in the absence of foreign repercussions. As a result, M_1 rises by $(\Delta Y_1)(MPM_1) = (572)(0.15) = 85.8$ and $\Delta S_1 = (\Delta Y_1)(MPS_1) = (572)(0.25) = 143$ with foreign repercussions.

Substituting these values into the equilibrium equation $\Delta I_1 + \Delta X_1 = \Delta S_1 + \Delta X_1$, we get $200 + \Delta X_1 = 143 + 85.8 = 228.8$. Therefore, the *induced* rise in $X_1 = 28.8$. With M_1 rising by 85.8 and X_1 increasing by 28.8, Nation 1's trade deficit is $85.8 - 28.8 = 57$ with foreign repercussions, as compared with 75 (point E'' in Figure 17.3) without. Thus, foreign repercussions make the trade surplus and deficit smaller than they would be without foreign repercussions.

Finally, if there is an autonomous increase in investment in *Nation 2, the foreign trade multiplier in Nation 1 with foreign repercussions for the autonomous increase in* $I_2(k^{**})$ is

$$k^{**} = \frac{\Delta Y_1}{\Delta I_2} = \frac{MPM_2/MPS_2}{MPS_1 + MPM_1 + MPM_2(MPS_1/MPS_2)} \qquad (17\text{-}13)$$

Note that $k^* = k^{**} + k''$. The effect of an autonomous increase in I_2 on Y_1 and the trade balance of Nation 1 is left as an end-of-chapter problem. The mathematical derivations of the foreign trade multipliers with foreign repercussions given by Equations (17-11), (17-12), and (17-13) are presented in Section A17.1 in the appendix.

Note that this is how business cycles are propagated internationally. For example, an expansion in economic activity in the United States spills into imports. Since these are the exports of other nations, the U.S. expansion is transmitted to other nations. The rise in the exports of these other nations expands their economic activity and feeds back to the United States through an increase in their imports from the United States. Another example is provided by the Great Depression of the 1930s. The sharp contraction in U.S. economic activity that started in the early 1930s greatly reduced the U.S. demand for imports. This tendency was reinforced by passage of the Smoot–Hawley Tariff, which was the highest tariff in U.S. history and led to retaliation by other nations (see Section 9.5A). The sharp reduction in U.S. imports had a serious deflationary effect (through the multiplier) on foreign nations, which then reduced their imports from the United States, causing a further reduction in the national income of the United States. Foreign repercussions were an important contributor to the spread of the depression to the entire world. Only a very small nation can safely ignore foreign repercussions from changes occurring in its own economy. Case Study 17-5 examines the impact, through trade linkages, of the financial crisis that started in Asia in July 1997 on the United States, Japan, and the European Union.

CASE STUDY 17-5 Effect of the Asian Financial Crisis of the Late 1990s on OECD Countries

Table 17.5 provides estimates of the effect of the financial crisis that started in Asia in July 1997 on the United States, Japan, the European Union, Canada, Australia, and New Zealand, which were made by the Organization of Economic Cooperation and Development (OECD) using its INTERLINK model. The financial crisis in Asia was transmitted through trade linkages to other nations and regions of the world. Specifically, the depreciation of the currencies of the nations in crisis stimulated their exports, while the reduction in their GDP reduced the demand for their imports. The effects are given in terms of reduced growth and worsened current account balance of other nations from what they would have had in the absence of the crisis.

The table shows that the financial crisis in Asia reduced the growth of real GDP in the United States by 0.4 percentage points in both 1998 and 1999 (from 4.7 percent to 4.3 percent in 1998 and from 4.2 percent to 3.8 percent in 1999). This amounted to about \$34–\$35 billion reduction in the GDP of the United States in 1998 and 1999. The reduction in growth (in percentage points) was similar in the European Union, but much greater for Japan, Australia, and New Zealand, and smaller in Canada. The table also shows that the crisis increased the current account deficit of the United States by \$13 billion in 1998 and by \$27 billion in 1999. The effect was similar in Japan and the European Union, but much smaller in Canada, Australia, and New Zealand. Thus, we can see that economic crises in some large nation or economic area can easily spread to other nations and areas through trade linkages and have a significant impact on them. This is even more evident from the financial crisis that started in the U.S. subprime mortgage market in 2007 and then spread to the entire financial and economic sectors of the United States and the rest of the world in 2008 (discussed in detail in Section 21.6E).

TABLE 17.5. Effect of the Asian Financial Crisis on Growth and Current Account of OECD Countries, 1998–1999

	Growth of Real GDP (Percent)		Current Account Balance (Billions of Dollars)	
	1998	1999	1998	1999
United States	−0.4	−0.4	−13	−27
Japan	−1.3	−0.7	−12	−22
European Union	−0.4	−0.2	−19	−28
Canada	−0.2	−0.3	−2	−3
Australia and New Zealand	−0.9	−0.1	−3	−4
OECD	−0.7	−0.4	−26	−55

Source: Organization for Economic Cooperation and Development, *OECD Economic Outlook* (Paris: OECD, June 1998), p. 17.

17.5 Absorption Approach

In this section, we integrate the automatic price and income adjustment mechanisms and examine the so-called absorption approach. Specifically, we examine the effect of induced (automatic) income changes in the process of correcting a deficit in the nation's balance of payments through a depreciation or devaluation of the nation's currency. These automatic income changes were omitted from Chapter 16 in order to isolate the automatic price adjustment mechanism.

We saw in Chapter 16 that a nation can correct a deficit in its balance of payments by allowing its currency to depreciate or by a devaluation (if the foreign exchange market is stable). Because the improvement in the nation's trade balance depends on the price elasticity of demand for its exports and imports, this method of correcting a deficit is referred to as the *elasticity approach*. The improvement in the deficit nation's trade balance arises because a depreciation or devaluation stimulates the nation's exports and discourages its imports (thus encouraging the domestic production of import substitutes). The resulting increase in production and in the real income of the deficit nation induces imports to rise, which neutralizes part of the original improvement in the nation's trade balance resulting from the depreciation or devaluation of its currency.

However, if the deficit nation is already at full employment, production cannot rise. Then, only if *real domestic absorption* (i.e., expenditures) is reduced will the depreciation or devaluation eliminate or reduce the deficit in the nation's balance of payments. If real domestic absorption is not reduced, either automatically or through contractionary fiscal and monetary policies, the depreciation or devaluation will lead to an increase in domestic prices that will completely neutralize the competitive advantage conferred by the depreciation or devaluation without any reduction of the deficit.

In terms of the bottom panel in Figure 17.3, a depreciation or devaluation of the deficit nation's currency shifts the $X - M(Y)$ function up (because X rises and M falls) and improves the nation's trade balance if the nation operated at less than full employment to begin with (and the Marshall–Lerner condition is satisfied). Note that the net final improvement in the nation's trade balance is less than the upward shift in the $X - M(Y)$ function because domestic production rises and induces imports to rise, thus neutralizing part of the original improvement in the trade balance. However, if the nation started from a position of full employment, the depreciation or devaluation leads to domestic inflation, which then shifts the $X - M(Y)$ function back down to its original position without any improvement in the trade balance. Only if domestic absorption is somehow reduced will some improvement in the trade balance of the deficit nation remain (i.e., the $X - M(Y)$ function will not shift all the way back to its original position).

The above analysis was first introduced in 1952 by *Alexander*, who named it the absorption approach. Alexander began with the identity that production or income (Y) is equal to consumption (C) plus domestic investment (I) plus foreign investment or the trade balance $(X - M)$, all in real terms. That is,

$$Y = C + I + (X - M) \tag{17-14}$$

But then letting A equal domestic absorption $(C + I)$ and B equal the trade balance $(X - M)$, we have

$$Y = A + B \tag{17-15}$$

By subtracting A from both sides, we get

$$Y - A = B \tag{17-16}$$

That is, domestic production or income minus domestic absorption equals the trade balance. For the trade balance (B) to improve as a result of a depreciation or devaluation, Y must rise and/or A must fall. If the nation was at full employment to begin with, production or real income (Y) will not rise, and the depreciation or devaluation can be effective only if domestic absorption (A) falls, either automatically or as a result of contractionary fiscal and monetary policies.

A depreciation or a devaluation of the deficit nation's currency automatically reduces domestic absorption if it redistributes income from wages to profits (since profits earners usually have a higher marginal propensity to save than wage earners). In addition, the increase in domestic prices resulting from the depreciation reduces the value of the real cash balances that the public wants to hold. To restore the value of real cash balances, the public must reduce consumption expenditures. Finally, rising domestic prices push people into higher tax brackets and also reduce consumption. Since we cannot be certain as to the speed and size of these automatic effects, contractionary fiscal and monetary policies may have to be used to cut domestic absorption adequately. These are discussed in the next two chapters.

Thus, while the elasticity approach stresses the demand side and implicitly assumes that slack exists in the economy that will allow it to satisfy the additional demand for exports and import substitutes, the absorption approach stresses the supply side and implicitly assumes an adequate demand for the nation's exports and import substitutes. It is clear, however, that both the elasticity approach and the absorption approach are important and both must be considered simultaneously.

Related to the automatic income adjustment mechanism and the absorption approach is the so-called *transfer problem*. This is discussed in Section A17.2 in the appendix.

17.6 Monetary Adjustments and Synthesis of the Automatic Adjustments

In this section, we first examine monetary adjustments to balance-of-payments disequilibria. We then present a synthesis of the automatic price, income, and monetary adjustments, and examine how they work in the real world. Finally, we conclude with a discussion of the disadvantages of automatic adjustment mechanisms.

17.6A Monetary Adjustments

Up to now, monetary adjustments have been omitted. However, when the exchange rate is not freely flexible, a deficit in the balance of payments tends to reduce the nation's money supply because the excess foreign currency demanded is obtained by exchanging domestic money balances for foreign exchange at the nation's central bank. Under a fractional-reserve banking system, this loss of reserves causes the nation's money supply to fall by a multiple of the trade deficit. Unless sterilized, or neutralized, by the nation's monetary authorities, the reduction in the money supply induces interest rates to rise in the deficit nation.

The rise in interest rates in the deficit nation discourages domestic investment and reduces national income (via the multiplier process), and this induces a decline in the nation's imports, which reduces the deficit. Furthermore, the rise in interest rates attracts foreign capital, thus helping the nation to finance the deficit. The opposite occurs in the surplus nation. Indeed, it is through these international capital flows and automatic income changes that adjustment seems actually to have occurred under the gold standard (rather than through the price-specie-flow mechanism described in Section 16.6B).

The reduction in its money supply and income also tends to reduce prices in the deficit nation relative to the surplus nation, further improving the trade balance of the deficit nation. This adjustment through changes in internal prices is *theoretically* most pronounced and direct under the gold standard, but it also occurs under other international monetary systems.

Indeed, as shown in Chapter 19, this automatic monetary-price adjustment mechanism could by itself eliminate the nation's trade deficit and unemployment, but only in the long run. In what follows, we assume that a change in the money supply affects the balance of payments, to some extent, through both interest rate changes and changes in internal prices.

17.6B Synthesis of Automatic Adjustments

Let us now integrate the automatic price, income, and monetary adjustments (i.e., provide a synthesis of automatic adjustments) for a nation that faces unemployment and a deficit in its balance of payments at the equilibrium level of income.

Under a freely flexible exchange rate system and a stable foreign exchange market, the nation's currency will depreciate until the deficit is entirely eliminated. Under a managed float, the nation's monetary authorities usually do not allow the full depreciation required to eliminate the deficit completely. Under a fixed exchange rate system (such as the one that operated during most of the postwar period until 1973), the exchange rate can depreciate only within the narrow limits allowed so that most of the balance-of-payments adjustment must come from elsewhere.

A depreciation (to the extent that it is allowed) stimulates production and income in the deficit nation and induces imports to rise, thus reducing part of the original improvement in the trade balance resulting from the depreciation. Under a freely flexible exchange rate system, this simply means that the depreciation required to eliminate a balance-of-payments deficit is larger than if these automatic income changes were not present.

Except under a freely flexible exchange rate system, a balance-of-payments deficit tends to reduce the nation's money supply, thus increasing its interest rates. This, in turn, reduces domestic investment and income in the deficit nation, which induces its imports to fall and thereby reduces the deficit. The increase in interest rates also attracts foreign capital, which helps the nation finance the deficit. The reduction in income and in the money supply also causes prices in the deficit nation to fall relative to prices in the surplus nation, thus further improving the balance of trade of the deficit nation.

Under a fixed exchange rate system, most of the automatic adjustment would have to come from the monetary adjustments discussed above, unless the nation devalues its currency. On the other hand, under a freely flexible exchange rate system, the national economy is to a large extent supposed to be insulated from balance-of-payments disequilibria, and most of the adjustment in the balance of payments is supposed to take place through exchange rate variations. (The fixed and flexible exchange rate systems are evaluated and compared in Chapter 20.)

When all of these automatic price, income, and monetary adjustments are allowed to operate, the adjustment to balance-of-payments disequilibria is likely to be more or less complete even under a fixed exchange rate system. The problem is that automatic adjustments frequently have serious disadvantages, which nations often try to avoid by the use of adjustment policies. These are examined in Chapters 18 and 19.

In the real world, income, prices, interest rates, exchange rates, the current account, and other variables change as a result of an autonomous disturbance (such as an increase in expenditures) in one nation, and a disturbance in one nation affects other nations, with repercussions back to the first nation. It is very difficult to trace all of these effects in the real world because of the very intricate relationships that exist among these variables and also because, over time, other changes and disturbances occur, and nations also adopt various policies to achieve domestic and international objectives.

With the advent of large computers, large-scale models of the economy have been constructed, and they have been used to estimate foreign trade multipliers and the net effect on income, prices, interest rates, exchange rates, current account, and other variables that would result from an autonomous change in expenditures in one nation or in the rest of the world. Although these models are very complex, they do operate according to the general principles examined in this chapter (see Case Study 17-6).

CASE STUDY 17-6 Interdependence in the World Economy

Table 17.6 shows the effect of an autonomous increase in government expenditures on gross national product (GNP), consumer price index (CPI), interest rate, currency value, and current account in the nation or group of nations where the increase in government expenditures takes place, and their repercussions on the trade partner(s). These simulation results were obtained using the Multi-Country Model of the Federal Reserve Board. Although the effects of an increase in government expenditures are felt over several years, the results reported in Table 17.6 show the effect in the second year after government expenditures increased. Part A of the table shows the effect of an increase in U.S. government expenditures of 1 percent on the United States and on the rest of the OECD. OECD refers to the Organization for Economic Cooperation and Development, which included all 24 of the world's industrial countries at the time of the exercise.

Part A of the table shows that the increase in U.S. government expenditures equal to 1 percent of its GNP results (through the multiplier process) in an increase of 1.8 percent in the U.S. GNP in the second year after the United States increased its expenditures. A longer period of time would show a larger total effect. It also leads to a 0.4 percent increase in U.S. prices, a 1.7 percentage point increase (say from 4 percent to 5.7 percent) in U.S. short-term interest rates, a 2.8 percent increase in the international value of the dollar (appreciation), and a (−)$16.5 billion deterioration in the U.S. current account balance. The dollar appreciates because the increase in capital inflows attracted by the increase in the U.S. interest rate exceeds the induced rise in imports resulting from the increase in U.S. GNP.

The top right part of the table shows that the increase in U.S. imports resulting from the increase in its expenditures and income stimulates the growth of GNP in the rest of OECD by 0.7 percent. This, in turn, leads to an increase of 0.4 percent in prices and a 0.4 percentage point increase in short-term interest rates in the other

(continued)

■ CASE STUDY 17-6 Continued

■ TABLE 17.6. Estimated Effect in Second Year of an Increase in Government Expenditures Equal to 1 Percent of GNP

A. Increase in Government Expenditures in United States		
	Effect in United States	Effect in Rest of OECD
GNP	1.8%	0.7%
CPI	0.4%	0.4%
Interest rate	1.7%[a]	0.4%[a]
Currency value	2.8%	–
Current account	−$16.5 billion	$8.9 billion
B. Increase in Government Expenditures in Rest of OECD		
	Effect in Rest of OECD	Effect in United States
GNP	1.4%	0.5%
CPI	0.3%	0.2%
Interest rate	0.6%[a]	0.5%[a]
Currency value	0.3%	–
Current account	−$7.2 billion	$7.9 billion

[a]= percentage point change.
Source: R. Bryant, D. Henderson, G. Holtham, P. Hooper, and S. Symansky, eds., *Empirical Macroeconomics for Interdependent Economies* (Washington, D.C.: Brookings Institution, 1988), p. 21.

OECD countries. The appreciation of the dollar means a depreciation of the currencies of the other OECD countries and an improvement of $8.9 billion in their current account balance. The average depreciation of the other OECD countries was not estimated, and the improvement in their current account is smaller than the increase in the U.S. current account *deficit* because a great deal of U.S. imports also come from OPEC (Organization of Petroleum Exporting Countries) and LDCs (less developed countries).

Part B of the table shows that an autonomous increase in government expenditures in the rest of OECD would lead to a 1.4 percent increase in their average GNP, a 0.3 percent increase in prices, a 0.6 percentage point increase in short-term interest rates, a 0.3 percent appreciation of their currencies, and a (−)$7.2 billion deterioration in the current account balance. These changes have repercussions in the United States, where GNP increases by 0.5 percent, prices increase by 0.2 percent, short-term interest rates increase by 0.5 percentage points, and the U.S. current account improves by $7.9 billion. Other models of the world economy give similar results (see *McKibbin*, 1997). The strong interdependence in the world economy today could also be shown by other changes taking place in the United States or in its trade partners.

17.6c Disadvantages of Automatic Adjustments

The disadvantages facing a freely flexible exchange rate system may be overshooting and erratic fluctuations in exchange rates. These interfere with the flow of international trade (even though foreign exchange risks can often be hedged at a cost) and impose costly adjustment burdens (in the form of shifts in the use of domestic resources and in the pattern of specialization) that might be entirely unnecessary in the long run.

Under a managed floating exchange rate system, erratic exchange rate fluctuations can be avoided, but monetary authorities may manage the exchange rate so as to keep the domestic currency undervalued to stimulate the domestic economy at the expense of other nations (thus inviting retaliation). Such competitive depreciations or devaluations (beggar-thy-neighbor policies) proved very disruptive and damaging to international trade in the period between the two world wars (see Section 21.2B).

On the other hand, the possibility of a devaluation under a fixed exchange rate system can lead to destabilizing international capital flows, which can also prove very disruptive. A fixed exchange rate system also forces a nation to rely primarily on monetary adjustments.

Automatic income changes can also have serious disadvantages. For example, a nation facing an autonomous increase in its imports at the expense of domestic production would have to allow its national income to fall in order to reduce its trade deficit. Conversely, a nation facing an autonomous increase in its exports from a position of full employment would have to accept domestic inflation to eliminate the trade surplus.

Similarly, for the automatic monetary adjustments to operate, the nation must passively allow its money supply to change as a result of balance-of-payments disequilibria and thus give up its use of monetary policy to achieve the more important objective of domestic full employment without inflation. For all of these reasons, nations often will use adjustment policies to correct balance-of-payments disequilibria instead of relying on automatic mechanisms.

SUMMARY

1. The income adjustment mechanism relies on induced changes in the national income of the deficit and surplus nations to bring about adjustment in the balance of payments. To isolate the income adjustment mechanism, we initially assume that the nation operates under a fixed exchange rate system and that all prices, wages, and interest rates are constant. We also begin by assuming that the nation operates at less than full employment.

2. In a closed economy without a government sector, the equilibrium level of national income (Y_E) is equal to the desired flow of consumption expenditures (C) plus desired investment expenditures (I). That is, $Y = C(Y) + I$. Equivalently, Y_E occurs where $S = I$. If $Y \neq Y_E$, desired expenditures do not equal the value of output and $S \neq I$. The result is unplanned inventory investment or disinvestment, which pushes the economy toward Y_E. An increase in I causes Y_E to rise by a multiple of the increase in I. The ratio of the increase in Y_E to the increase in I is called the multiplier (k), which is given by the reciprocal of the marginal propensity to save (MPS). The increase in Y_E induces S to rise by an amount equal to the autonomous increase in I.

3. In a small open economy, exports (X) are exogenous, or independent of the nation's income, just as I is. On the other hand, imports (M) depend on income, just as S does. The ratio of the change in M for a given change in Y is the marginal propensity to import (MPM). Y_E is determined where the sum of the injections $(I + X)$ equals the sum of the leakages $(S + M)$. The condition for Y_E can also be rewritten as $X - M = S - I$ and as $I + (X - M) = S$. The foreign trade multiplier $k' = 1/(MPS + MPM)$ and is smaller than the corresponding closed economy multiplier (k). An autonomous increase in I and/or X causes Y_E to change by k' times ΔI and/or ΔX. The change in Y_E induces S to change by $(MPS)\,(\Delta Y)$ and

M to change by $(MPM)(\Delta Y)$, but adjustment in the trade balance is incomplete.

4. If the nations are not small, foreign repercussions cannot be safely ignored. In a two-nation world, an autonomous increase in the exports of Nation 1 arises from and is equal to the autonomous increase in the imports of Nation 2. If occurring at the expense of domestic production, this reduces the income and imports of Nation 2 and represents a foreign repercussion of Nation 1 that neutralizes part of the original autonomous increase in the exports of Nation 1. Thus, the foreign trade multiplier and trade surplus of Nation 1 with foreign repercussions is smaller than that without foreign repercussions (see Equation (17-11)). We can also calculate the foreign trade multiplier for Nation 1 with foreign repercussions for an autonomous increase in investment in Nation 1 (see Equation (17-12)) and in Nation 2 (see Equation (17-13)). Foreign repercussions explain how business cycles are transmitted internationally.

5. The absorption approach integrates the automatic price and income adjustment mechanisms. For example, a depreciation or devaluation stimulates the domestic production of exports and import substitutes and increases the level of real national income. This induces an increase in the nation's imports, which neutralizes part of the original improvement in its trade balance. But if the nation is at full employment to begin with, production cannot rise, and the depreciation or devaluation will instead increase domestic prices so as to leave the trade balance completely unchanged, unless real domestic absorption is somehow reduced.

6. When the exchange rate is not freely flexible, a depreciation of the deficit nation's currency will correct part, but not all, of the deficit. The deficit then leads to a reduction in the nation's money supply and an increase in its interest rate. This induces a fall in investment, income, and imports, which reduces the deficit. It also induces a capital inflow. In addition, the reduction in the money supply and incomes reduces prices in the deficit nation relative to prices in the surplus nation, and this further improves the former's trade balance. All of these automatic adjustment mechanisms together are likely to bring about a complete balance-of-payments adjustment, but they sacrifice internal to external balance.

A LOOK AHEAD

Chapters 18 and 19 deal with adjustment policies. Specifically, we will examine how a change in the exchange rate, together with monetary and fiscal policies, can be used to achieve balance-of-payments equilibrium as well as full employment without inflation. If the nation is unwilling to change its exchange rate or allow it to vary, the government could use monetary policy to achieve balance-of-payments equilibrium and fiscal policy to achieve full employment but would have no policy, except price controls, to fight inflation.

KEY TERMS

Absorption approach, p. 558
Average propensity to import (APM), p. 546
Closed economy, p. 542
Consumption function, p. 542
Desired or planned investment, p. 542
Equilibrium level of national income, p. 542
Export function, p. 548
Foreign repercussions, p. 555
Foreign trade multiplier (k'), p. 552
Import function, p. 546
Income elasticity of demand of imports (n_Y), p. 547
Investment function, p. 544
Marginal propensity to consume (MPC), p. 542
Marginal propensity to import (MPM), p. 546
Marginal propensity to save (MPS), p. 544
Multiplier (k), p. 545
Saving function, p. 544
Synthesis of automatic adjustments, p. 560

QUESTIONS FOR REVIEW

1. How does the automatic income adjustment mechanism operate to bring about adjustment in a nation's balance of payments? What are the variables that we hold constant to isolate the income adjustment mechanism?

2. What is meant by a closed economy? by desired or planned investment, consumption, and saving? What is meant by investment being exogenous? What are a consumption function, a saving function, and an investment function?

3. What do the MPC and the MPS measure?

4. How is the equilibrium level of national income determined in a closed economy? How is the size of the closed economy multiplier *(k)* determined?

5. What is meant by exports being exogenous? What is meant by MPM, APM, and n_Y?

6. How is the equilibrium level of national income determined in a small open economy? What is the value of the foreign trade multiplier (k')?

7. What is meant when we say that the automatic income adjustment mechanism brings about incomplete adjustment in the balance of trade or payments?

8. What is meant by foreign repercussions? When is it not safe to ignore them?

9. What is the multiplier formula for Nation 1 with foreign repercussions for an autonomous increase in its exports that replaces domestic production in Nation 2?

10. What is the multiplier formula for an autonomous increase in investment in Nation 1? in Nation 2? How are foreign repercussions related to international business cycles?

11. What is meant by the elasticity approach? the absorption approach? In what way does the absorption approach integrate the automatic price and income adjustment mechanisms?

12. What happens to the trade balance of a deficit nation if it allows its currency to depreciate or devalue from a position of full employment? How can real domestic absorption be reduced?

13. What is meant by automatic monetary adjustments? How do they help to adjust balance-of-payments disequilibria?

14. How do all the automatic adjustment mechanisms operate together to correct a deficit in a nation's balance of payments under a fixed or managed exchange rate system when the nation operates at less than full employment? What is the disadvantage of each automatic adjustment mechanism?

PROBLEMS

1. Given $C = 100 + 0.8Y$ and autonomous investment $I = 100$, draw a figure showing the equilibrium level of national income.

2. For the given in Problem 1:

   (a) Write the equation of the saving function.

   (b) Draw a figure showing the equilibrium level of national income in terms of desired saving and investment.

3. Starting from the given and figure of Problem 1, and assuming that autonomous investment expenditures increase from $I = 100$ to $I' = 200$, draw a figure in terms of total expenditures showing the new equilibrium level of national income.

4. Starting from the given and figure of Problem 2, and assuming that autonomous investment expenditures increase from $I = 100$ to $I' = 200$:

   (a) Draw a figure in terms of desired saving and investment showing the new equilibrium level of national income.

   (b) Determine the value of the multiplier.

***5.** Given $C = 100 + 0.8Y$, $M = 150 + 0.20Y$, $I = 100$, and $X = 350$:

(a) Determine Y_E algebraically.

(b) Show the determination of Y_E graphically as in the top panel of Figure 17.3.

***6.** For the same given as in Problem 5, show the determination of Y_E graphically as in the bottom panel of Figure 17.3.

7. Starting with the algebraic and graphical results of Problems 5 and 6, determine algebraically and determine graphically the effect on Y_E of an autonomous:

(a) Increase in X of 200.

(b) Increase in I of 200.

(c) Increase in X and I of 200.

8. Starting with the algebraic and graphical results of Problems 5 and 6, determine algebraically and determine graphically the effect on Y_E of an autonomous:

(a) Decrease in S of 100.

(b) Decrease in M of 100.

(c) Decrease in S and M of 100.

*= Answer provided at www.wiley.com/college/salvatore.

***9.** Assuming that Nations 1 and 2 are both large, and starting from the equilibrium level of national income and equilibrium in the trade balance in Nation 1, and given that $MPS_1 = 0.20$, $MPS_2 = 0.15$, $MPM_1 = 0.20$, and $MPM_2 = 0.10$, find the change in the equilibrium level of national income and the trade balance in Nation 1 for:

(a) An autonomous increase in the exports of Nation 1 of 200 that replaces domestic production in Nation 2.

(b) An autonomous increase in investment of 200 in Nation 1.

10. Do the same as in Problem 9 for an autonomous increase in investment of 200 in Nation 2.

11. Do the same as in Problem 9 for the numerical example in Section 17.4.

12. Starting from your graphical results of Problem 7b, show graphically the effect on Y_E and on $X - M$ of a depreciation of the nation's currency from a position of full employment and a trade deficit.

13. Under what conditions would Equation (17-8) not hold in the real world?

14. Identify the advantages of automatic over policy adjustments to correct a trade disequilibrium.

APPENDIX

In this appendix, Section A17.1 presents the mathematical derivation of the foreign trade multipliers with foreign repercussions, and Section A17.2 examines the transfer problem.

A17.1 Derivation of Foreign Trade Multipliers with Foreign Repercussions

For the purpose of deriving foreign trade multipliers with foreign repercussions, we will simplify the notations by letting nonasterisked symbols refer to Nation 1 and asterisked symbols refer to Nation 2. Furthermore, we will let $s = MPS$ and $m = MPM$.

The changes in the equilibrium level of national income for Nation 1 and Nation 2 (from Equation (17-9)) are

$$\Delta I + \Delta X = \Delta S + \Delta M$$
$$\Delta I^* + \Delta X^* = \Delta S^* + \Delta M^* \qquad (17A\text{-}1)$$

We know that $\Delta S = s\Delta Y$, $\Delta M = m\Delta Y$, $\Delta S^* = s^*\Delta Y^*$, and $\Delta M^* = m^*\Delta Y^*$. We also know that the change in Nation 1's exports (ΔX) equals the change in Nation 2's imports ($\Delta M^* = m^*\Delta Y^*$), and the change in Nation 2's exports (ΔX^*) equals the change in Nation 1's imports ($\Delta M = m\Delta Y$). Substituting these values into Equation (17A-1), we get

$$\begin{aligned} \Delta I + m^*\Delta Y^* &= s\Delta Y + m\Delta Y \\ \Delta I^* + m\Delta Y &= s^*\Delta Y^* + m^*\Delta Y^* \end{aligned} \tag{17A-2}$$

From Equation (17A-2), we can derive the foreign trade multipliers with foreign repercussions. We begin by deriving the foreign trade multiplier with foreign repercussions for Nation 1 for an autonomous increase in investment in Nation 1 (k^* given by Equation (17-12)). Since there is no autonomous change in investment in Nation 2, $\Delta I^* = 0$. Solving the second equation of (17A-2) for ΔY^* and substituting into the first equation, we get

$$m\Delta Y = s^*\Delta Y^* + m^*\Delta Y^*$$

$$m\Delta Y = (s^* + m^*)\Delta Y^*$$

$$\frac{m\Delta Y}{s^* + m^*} = \Delta Y^*$$

$$\Delta I + m^*\frac{(m\Delta Y)}{s^* + m^*} = s\Delta Y + m\Delta Y$$

$$\Delta I = (s + m)\Delta Y - \frac{(m^*m)}{s^* + m^*}\Delta Y$$

$$\Delta I = \left[(s + m) - \frac{m^*m}{s^* + m^*}\right]\Delta Y$$

$$\Delta I = \left[\frac{(s + m)(s^* + m^*) - m^*m}{s^* + m^*}\right]\Delta Y$$

$$\Delta I = \left[\frac{ss^* + m^*m + ms^* + m^*s + m^*m}{s^* + m^*}\right]\Delta Y$$

$$\frac{\Delta I}{\Delta Y} = \left[\frac{ss^* + ms^* + m^*s}{s^* + m^*}\right]$$

$$\frac{\Delta Y}{\Delta I} = \frac{s^* + m^*}{ss^* + ms^* + m^*s}$$

Dividing numerator and denominator by s^*, we get

$$k^* = \frac{\Delta Y}{\Delta I} = \frac{1 + (m^*/s^*)}{s + m + (m^*s/s^*)}$$

This is Equation (17-12) given in Section 17.4.

Starting once again with Equation (17A-2), we can similarly derive the foreign trade multiplier for Nation 1 for an autonomous increase in investment in Nation 2 (k^{**} given by Equation (17-13)). Since there is no autonomous change in investment in Nation 1,

$\Delta I = 0$. Solving the first equation of (17A-2) for ΔY^* and substituting into the second equation, we get

$$\Delta Y^* = \frac{(s+m)}{m^*}\Delta Y$$

$$\Delta I^* + m\Delta Y = s^*\frac{(s+m)}{m^*}\Delta Y + m^*\frac{(s+m)}{m^*}\Delta Y$$

$$\Delta I^* = \left[s^*\frac{(s+m)}{m^*} + m^*\frac{(s+m)}{m^*} - m\right]\Delta Y$$

$$\Delta I^* = \left[\frac{s^*s + s^*m}{m^*} + \frac{m^*s + m^*m}{m^*} - \frac{mm^*}{m^*}\right]\Delta Y$$

$$\Delta I^* = \left[\frac{s^*s + s^*m + m^*s}{m^*}\right]\Delta Y$$

$$\frac{\Delta Y}{\Delta I^*} = \frac{m^*}{s^*s + s^*m + m^*s}$$

$$k^{**} = \frac{\Delta Y}{\Delta I^*} = \frac{(m^*/s^*)}{s + m + (m^*s/s^*)}$$

This is Equation (17-13) in Section 17.4.

We can now derive the foreign trade multiplier with foreign repercussions for Nation 1 for an autonomous increase in the exports of Nation 1 that replaces production in Nation 2 (so that the total combined expenditures in both nations remain unchanged). The autonomous increase in the exports of Nation 1 has the same effect on the equilibrium level of income of Nation 1 as an equal autonomous increase in investment in Nation 1 ($\Delta Y/\Delta I$ given by Equation (17-12)). The equal decrease in expenditures in Nation 2 has the same effect on the equilibrium level of income of Nation 1 as a decrease in investment in Nation 2 by the same amount ($-\Delta Y/\Delta I^*$ given by Equation (17-13)). Thus,

$$k'' = \frac{\Delta Y}{\Delta X} = \frac{\Delta Y}{\Delta I} - \frac{\Delta Y}{\Delta I^*}$$

That is, k'' is given by Equation (17-12) minus Equation (17-13). This gives Equation (17-11).

Problem (a) Starting from Equation (17A-2), derive k'' for Nation 1 in the same way that k^* and k^{**} were derived. (b) What is the value of the foreign trade multiplier with foreign repercussions for Nation 1 if the autonomous increase in the exports of Nation 1 represents entirely an increase in expenditures in Nation 2?

A17.2 The Transfer Problem Once Again

This presentation builds on the discussion of the transfer problem in the appendix to Chapter 12. The transfer problem is discussed here because it is related to the automatic income and price adjustment mechanisms. It deals with the conditions under which a large and unusual capital transfer is actually accomplished by an export surplus of the paying nation and an equal import surplus of the receiving nation.

Attention was first focused on this problem in connection with the reparations that Germany had to pay to France after World War I, which gave rise to the now famous debate on the subject between *Keynes* and *Ohlin* (see the Selected Bibliography for the references). A more recent concern was the transfer problem that arose between petroleum-importing and petroleum-exporting nations because of the sharp increase in petroleum prices during the 1970s.

We examine the transfer problem by assuming that both the paying and the receiving nation are operating under a fixed exchange rate system and full employment. The transfer of real resources occurs only if expenditures in the paying and/or the receiving country are affected. If the financial transfer is effected out of idle balances (say, idle bank balances) in the paying nation and goes into idle balances (saving) in the receiving nation, expenditures are not affected in either nation and there is no transfer of real resources. For the transfer of real resources to take place, either taxes must be increased in the paying nation so as to reduce expenditures and/or expenditures must rise in the receiving nation through a reduction in taxes or an increase in services.

The reduction in expenditures in the paying nation will induce its imports to fall, while the increase in expenditures in the receiving nation will induce its imports to rise. In a two-nation world (the paying and the receiving nation), this leads to a trade surplus in the paying nation and an equal trade deficit in the receiving nation (if both nations had a zero trade balance before the transfer). It is only through the trade surplus of the paying nation and the corresponding trade deficit of the receiving nation that the transfer of real resources can be accomplished.

If the *sum* of the *MPM* in the paying nation and the *MPM* in the receiving nation equals 1, the entire financial transfer is accomplished with an equal transfer of real resources (through the change in trade balance). In this case, we say that the adjustment is *complete*. If, on the other hand, the sum of the *MPM*s in the two nations is less than 1, the transfer of real resources falls short of the transfer of financial resources. In this case, we say that the adjustment is *incomplete*. If the sum of the *MPM*s in the two nations is greater than 1, the transfer of real resources (i.e., the net change in the trade balance in each nation) is greater than the financial transfer, and the adjustment is said to be *over-complete*. Finally, if the trade balance of the paying nation deteriorates instead of improving (so that the trade balance of the receiving nation improves), the adjustment is said to be *perverse*. In this case, there is a transfer of real resources from the receiving to the paying country instead of the opposite, as is required.

If adjustment via income changes alone is incomplete, the terms of trade of the paying nation will have to deteriorate (and those of the receiving nation improve) to complete the adjustment. A deterioration in the paying nation's terms of trade will further reduce its real national income and imports. The reduction in its export prices in relation to its import prices will discourage the nation's imports and encourage its exports still further, thus contributing to completion of the transfer. On the other hand, if adjustment via income changes is overcomplete, the terms of trade of the paying nation must *improve* to make the adjustment merely complete.

For example, suppose that Nation A has to transfer (or lend) \$100 million to Nation B, and in the process the income of Nation A falls by \$100 million while the income of Nation

B increases by the same amount. If $MPM = m = 0.4$ for Nation A and $MPM = m^* = 0.6$ for Nation B, Nation A's imports will fall by \$40 million while Nation B's imports (equal to Nation A's exports) will rise by \$60 million, for a net improvement of \$100 million in Nation A's trade balance. As a result, the transfer is complete without any need for the terms of trade to change. If instead $m = 0.2$ and $m^* = 0.5$, Nation A's imports will fall by \$20 million while Nation B's imports (A's exports) will rise by \$50 million, for a net improvement of only \$70 million in Nation A's balance of trade. A deficit of \$30 million remains in Nation A's balance of payments (because of the \$100 million capital outflow and \$70 million trade balance surplus), and we say that the transfer is incomplete. The terms of trade of Nation A must then deteriorate and Nation B's terms of trade improve to complete the transfer. Finally, if $m = 0.5$ and $m^* = 0.7$, Nation A's trade balance will improve by \$120 million and the adjustment will be overcomplete. Then Nation A's terms of trade will have to improve sufficiently to make the adjustment merely complete.

In the real world, we can expect $m + m^* < 1$ and adjustment through income changes alone to be incomplete. A "secondary burden" of adjustment then falls on the terms of trade; that is, the terms of trade of the paying nation must deteriorate (and those of the receiving nation improve) for the transfer to be complete.

Problem Discuss how the transfer arising from the sharp increase in petroleum prices during the 1970s was accomplished. What happened during the 1980s?

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INTERNet

Data on exchange rates (daily, monthly, and trade-weighted average from 1971 or 1973) for the United States and the world's most important currencies, as well as data on current account balances, that can be used to find the effect of exchange rate changes on the trade and current account balances of the United States and other nations are found on the Federal Reserve Bank of St. Louis web site at:

http://research.stlouisfed.org/fred2

Some recent studies on the effect of international trade and finance on the U.S. economy are found on the web sites of the Peterson Institute for International Economics and the Council of Foreign Relations at:

http://www.iie.com

http://www.cfr.org

Data to examine the effect of changes in the trade and current account balances on the economy of the United States are found on the Bureau of Economic Analysis and the Federal Reserve Bank of St. Louis web sites, respectively, at:

http://www.bea.doc.gov

http://www.stls.frb.org

Trade data to examine the economic impact of a change in the trade and current account balances on the economies of the European Monetary Union and Japan are found on the web sites of their central bank, respectively, at:

http://www.ecb.int

http://www.boj.or.jp/en/index.htm

Data for measuring the effect of the financial crisis in Mexico, Latin America, and other emerging markets are found on the web sites of the Inter-American Development Bank and the Asian Development Bank at:

http://www.iadb.org

http://www.adb.org

chapter 18

Open-Economy Macroeconomics: Adjustment Policies

LEARNING GOALS:

After reading this chapter, you should be able to:

- Understand how a nation can achieve internal and external balance with fiscal and monetary policies under a fixed and a flexible exchange rate system
- Understand the difficulties and experiences in achieving internal and external balance
- Understand the disadvantage of using direct controls to achieve internal and external balance

18.1 Introduction

In this chapter, we examine the adjustment policies that are used to achieve full employment with price stability and equilibrium in the balance of payments. The need for adjustment policies arises because the automatic adjustment mechanisms discussed in the previous two chapters have serious unwanted side effects (see Section 17.6c). The economist most responsible for shifting the emphasis from automatic adjustment mechanisms to adjustment policies was *James Meade*.

The most important economic goals or objectives of nations are (1) internal balance, (2) external balance, (3) a *reasonable* rate of growth, (4) an *equitable* distribution of income, and (5) *adequate* protection of the environment. Internal balance refers to full employment or a rate of unemployment of no more than, say, 4 to 5 percent per year (the so-called *frictional unemployment* arising in the process of changing jobs) and a rate of inflation of no more than 2 or 3 percent per year. External balance refers to equilibrium in the balance of payments (or a desired temporary disequilibrium such as a surplus that a nation may want in order to replenish its depleted international reserves). In general, nations place priority on internal over external balance, but they are sometimes forced to switch their priority when faced with large and persistent external imbalances.

To achieve these objectives, nations have the following policy instruments at their disposal: (1) expenditure-changing, or demand, policies, (2) expenditure-switching policies, and (3) direct controls. Expenditure-changing policies include both fiscal and monetary policies. *Fiscal policy* refers to changes in government expenditures, taxes, or both. Fiscal policy is *expansionary* if government expenditures are increased and/or taxes reduced. These actions lead to an expansion of domestic production and income through a multiplier process (just as in the case of an increase in domestic investment or exports) and induce a rise in imports (depending on the marginal propensity to import of the nation). *Contractionary* fiscal policy refers to a reduction in government expenditures and/or an increase in taxes, both of which reduce domestic production and income and induce a fall in imports.

The introduction of the government sector means that the equilibrium condition of Equation (17-6) (repeated here for ease of reference as Equation (18-1)) must be extended to become Equation (18-2), where G refers to government expenditures and T to taxes:

$$I + X = S + M \tag{18-1}$$

$$I + X + G = S + M + T \tag{18-2}$$

Government expenditures *(G)*, just like investments *(I)* and exports *(X)*, are injections into the system, while taxes *(T)*, just like savings *(S)* and imports *(M)*, are a leakage from the system. Equation (18-2) can also be rearranged as

$$(G - T) = (S - I) + (M - X) \tag{18-3}$$

which postulates that a government budget deficit $(G > T)$ must be financed by an excess of S over I and/or an excess of M over X (see Case Study 18-1). Expansionary fiscal policy refers to an increase in $(G - T)$, and this can be accomplished with an increase in G, a reduction in T, or both. Contractionary fiscal policy refers to the opposite.

Monetary policy involves a change in the nation's money supply that affects domestic interest rates. Monetary policy is *easy* if the money supply is increased and interest rates fall. This induces an increase in the level of investment and income in the nation (through the multiplier process) and induces imports to rise. At the same time, the reduction in the interest rate induces a short-term capital outflow or reduced inflow. On the other hand, *tight* monetary policy refers to a reduction in the nation's money supply and a rise in the interest rate. This discourages investment, income, and imports, and also leads to a short-term capital inflow or reduced outflow.

CASE STUDY 18-1 Government, Private-Sector, and Current Account Balances in the G-7 Countries

Table 18.1 shows the average government balance $(G - T)$, the private-sector balance $(S - I)$, and the trade or current account balance $(X - M)$ as a percentage of GDP for the G-7 countries over the 1996–2000 period and their values in 2001. From the table we see that Equation (18-3) (slightly reformulated) holds. For example, for the United States in 2001, $T - G = 0.6$ (a budget surplus). Therefore, $G - T = -0.6$ is equal to $S - I = -4.7$ plus $M - X$ or *minus* $X - M = -(-4.1) = +4.1$. Thus, we have $-0.6 = -4.7 + 4.1$. The table shows that Japan had the largest budget deficit and the largest private-sector and current account surpluses over the 1996–2001 period among the G-7 countries, while the United States had the largest private balance and current account deficit.

(continued)

CASE STUDY 18-1 Continued

■ TABLE 18.1. Government, Private-Sector, and Current Account Balances as a Percentage of GDP in the G-7 Countries, 1996–2001

	Government Balances		Private-Sector Balances		Current Account Balances	
Country	1996–2000 Average	2001	1996–2000 Average	2001	1996–2000 Average	2001
United States	−0.1	0.6	−2.7	−4.7	−2.7	−4.1
Japan	−5.6	−6.4	7.9	8.5	2.3	2.1
Germany	−1.7	−2.5	1.2	1.8	−0.6	−0.7
United Kingdom	−0.6	1.1	−0.6	−2.9	−1.2	−1.8
France	−2.6	−1.5	4.7	3.0	2.2	1.6
Italy	−2.9	−1.4	4.6	1.5	1.6	0.1
Canada	0.5	2.8	−0.4	0.9	0.1	3.7

Source: Organization for Economic Cooperation and Development, *Economic Outlook* (Paris: OECD, December 2001), p. 134.

Expenditure-switching policies refer to changes in the exchange rate (i.e., a devaluation or revaluation). A devaluation switches expenditures from foreign to domestic commodities and can be used to correct a deficit in the nation's balance of payments. But it also increases domestic production, and this induces a rise in imports, which neutralizes a part of the original improvement in the trade balance. A revaluation switches expenditures from domestic to foreign products and can be used to correct a surplus in the nation's balance of payments. This also reduces domestic production and, consequently, induces a decline in imports, which neutralizes part of the effect of the revaluation.

Direct controls consist of tariffs, quotas, and other restrictions on the flow of international trade and capital. These are also expenditure-switching policies, but they can be aimed at specific balance-of-payments items (as opposed to a devaluation or revaluation, which is a general policy and applies to all items at the same time). Direct controls in the form of price and wage controls can also be used to stem domestic inflation when other policies fail.

Faced with multiple objectives and with several policy instruments at its disposal, the nation must decide which policy to utilize to achieve each of its objectives. According to *Tinbergen* (Nobel prize winner in economics in 1969), the nation usually needs as many effective policy instruments as the number of independent objectives it has. If the nation has two objectives, it usually needs two policy instruments to achieve the two objectives *completely*; if it has three objectives, it requires three instruments, and so on. Sometimes a policy instrument directed at a particular objective also helps the nation move closer to another objective. At other times, it pushes the nation even farther away from the second objective. For example, expansionary fiscal policy to eliminate domestic unemployment will also reduce a balance-of-payments surplus, but it will increase a deficit.

Since each policy affects both the internal and external balance of the nation, it is crucial that each policy be paired with and used for the objective toward which it is most effective, according to the principle of effective market classification developed by *Mundell*. We will see in Section 18.6A that if the nation does not follow this principle, it will move even farther from both balances.

In Section 18.2, we analyze the use of expenditure-changing and expenditure-switching policies to achieve both internal and external balance. Section 18.3 introduces new tools of analysis to define equilibrium in the goods market, in the money market, and in the balance of payments. These new analytical tools are then used to examine ways to reach internal and external balance with fixed exchanges in Section 18.4 and with flexible exchange rates in Section 18.5. Section 18.6 presents and evaluates the so-called assignment problem, or how fiscal and monetary policies must be used to achieve both internal and external balance. In Section 18.6B, we relax the assumption that domestic prices remain constant until full employment is reached. Section 18.7 then examines direct controls. In the appendix, we derive the condition for equilibrium in the goods market, in the money market, and in the balance of payments and present a mathematical summary of these new tools of analysis.

18.2 Internal and External Balance with Expenditure-Changing and Expenditure-Switching Policies

In this section, we examine how a nation can simultaneously attain internal and external balance with expenditure-changing and expenditure-switching policies. For simplicity we assume a zero international capital flow (so that the balance of payments is equal to the nation's trade balance). We also assume that prices remain constant until aggregate demand begins to exceed the full-employment level of output. The assumption of no international capital flow is relaxed in the next section, and the assumption of no inflation until full employment is reached is relaxed in Section 18.6B.

In Figure 18.1, the vertical axis measures the exchange rate (R). An increase in R refers to a devaluation and a decrease in R to a revaluation. The horizontal axis measures real domestic expenditures, or absorption (D). Besides domestic consumption and investments, D also includes government expenditures (which can be manipulated in the pursuit of fiscal policy).

The EE curve shows the various combinations of exchange rates and real domestic expenditures, or absorption, that result in external balance. The EE curve is positively inclined because a higher R (due to a devaluation) improves the nation's trade balance (if the Marshall–Lerner condition is satisfied) and must be matched by an increase in real domestic absorption (D) to induce imports to rise sufficiently to keep the trade balance in equilibrium and maintain external balance. For example, starting from point F on EE, an increase in R from R_2 to R_3 must be accompanied by an increase in D from D_2 to D_3 for the nation to maintain external balance (point J' on EE). A smaller increase in D will lead to a balance-of-trade surplus, while a larger increase in D will lead to a balance-of-trade deficit.

On the other hand, the YY curve shows the various combinations of exchange rates *(R)* and domestic absorption *(D)* that result in internal balance (i.e., full employment with price stability). The YY curve is negatively inclined because a lower R (due to a revaluation) worsens the trade balance and must be matched with larger domestic absorption *(D)* for the nation to remain in internal balance. For example, starting from point F on YY, a reduction in R from R_2 to R_1 must be accompanied by an increase in D from D_2 to D_3 to maintain internal balance (point J on YY). A smaller increase in D will lead to unemployment, while a larger increase in D will lead to excess aggregate demand and (demand-pull) inflation.

In Figure 18.1, we see that only at point F (i.e., at R_2 and D_2), defined as where the EE and YY curves intersect, will the nation be simultaneously in external and internal balance. With points above the EE curve referring to external surpluses and points below referring to deficits, and with points below the YY curve referring to unemployment and points above referring to inflation, we can define the following four zones of external and internal imbalance (see the figure):

Zone I External surplus and internal unemployment

Zone II External surplus and internal inflation

Zone III External deficit and internal inflation

Zone IV External deficit and internal unemployment

From the figure we can now determine the combination of expenditure-changing and expenditure-switching policies required to reach point F. For example, starting from point C (deficit and unemployment), both the exchange rate (R) and domestic absorption (D) must be increased to reach point F. By increasing R only, the nation can reach either external balance (point C' on the EE curve) or, with a larger increase in R, internal balance (point C'' on the YY curve), but it cannot reach both simultaneously. Similarly, by increasing domestic absorption only, the nation can reach internal balance (point J on the YY curve),

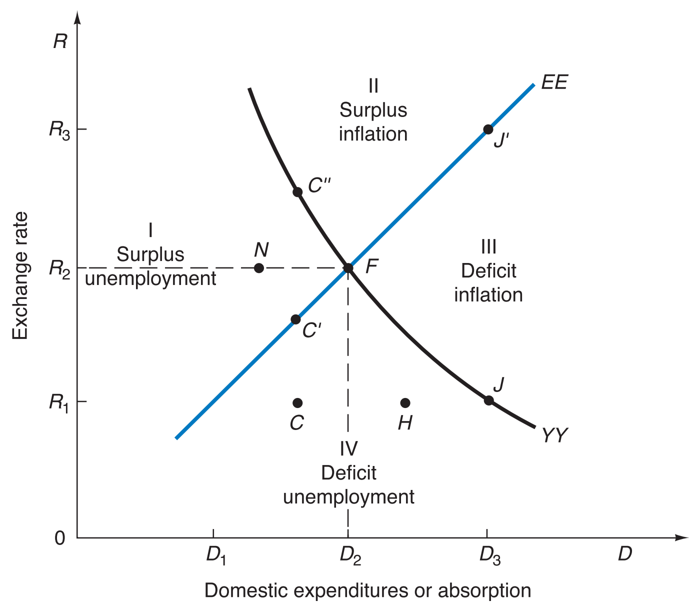

FIGURE 18.1. Swan Diagram.
The vertical axis measures the exchange rate and the horizontal axis real domestic expenditures, or absorption. Points on the *EE* curve refer to external balance, with points to the left indicating external surplus and points to the right indicating external deficit. Points on the *YY* curve refer to internal balance, with points to the left indicating internal unemployment and points to the right indicating internal inflation. The crossing of the *EE* and *YY* curves defines the four zones of external and internal imbalance and helps us determine the appropriate policy mix to reach external and internal balance simultaneously at point *F*.

but this leaves an external deficit because the nation will be below the *EE* curve. Note that although both point *C* and point *H* are in zone IV, point *C* requires an increase in domestic absorption while point *H* requires a decrease in domestic absorption to reach point *F* (see the figure).

Even if the nation were already in internal balance, say, at point *J* on *YY*, a devaluation alone could get the nation to point J' on *EE*, but then the nation would face inflation. Thus, two policies are usually required to achieve two goals simultaneously. Only if the nation happens to be directly across from or directly above or below point *F* will the nation be able to reach point *F* with a single policy instrument. For example, from point *N* the nation will be able to reach point *F* simply by increasing domestic absorption from D_1 to D_2. The reason is that this increase in domestic absorption induces imports to rise by the precise amount required to eliminate the original surplus without any change in the exchange rate. But this is unusual. The precise combination of expenditure-changing and expenditure-switching policies for each of the four zones of Figure 18.1 is left as an end-of-chapter problem. Figure 18.1 is called a Swan diagram in honor of *Trevor Swan*, the Australian economist who introduced it.

Under the fixed exchange rate system that prevailed from the end of World War II until 1971, industrial nations were generally unwilling to devalue or revalue their currency even when they were in *fundamental* disequilibrium. Surplus nations enjoyed the prestige of the surplus and the accumulation of reserves. Deficit nations regarded devaluation as a sign of weakness and feared it might lead to *destabilizing* international capital movements (see Chapter 21). As a result, nations were left with only expenditure-changing policies to achieve internal and external balance. This presented a serious theoretical problem until *Mundell* showed how to use fiscal policy to achieve internal balance and monetary policy to achieve external balance. Thus, even without an expenditure-switching policy, nations could theoretically achieve both internal and external balance simultaneously.

18.3 Equilibrium in the Goods Market, in the Money Market, and in the Balance of Payments

We now introduce the Mundell–Fleming model to show how a nation can use fiscal and monetary policies to achieve both internal and external balance without any change in the exchange rate. To do so, we need some new tools of analysis. These are introduced at an intuitive level in this section and rigorously in the appendix. The intuitive presentation here is adequate for our purposes, and there is no need to go to the appendix to understand what follows in the remainder of the chapter. The new tools introduced in this section will then be utilized in the next section to proceed with our analysis.

The new tools of analysis take the form of three curves: the *IS* curve, showing all points at which the goods market is in equilibrium; the *LM* curve, showing equilibrium in the money market; and the *BP* curve, showing equilibrium in the balance of payments. Short-term capital is now assumed to be responsive to international interest rate differentials. Indeed, it is this response that allows us to separate fiscal from monetary policies and direct fiscal policy to achieve internal balance and monetary policy to achieve external balance.

The *IS, LM*, and *BP* curves are shown in Figure 18.2. The *IS* curve shows the various combinations of interest rates *(i)* and national income *(Y)* that result in equilibrium in the

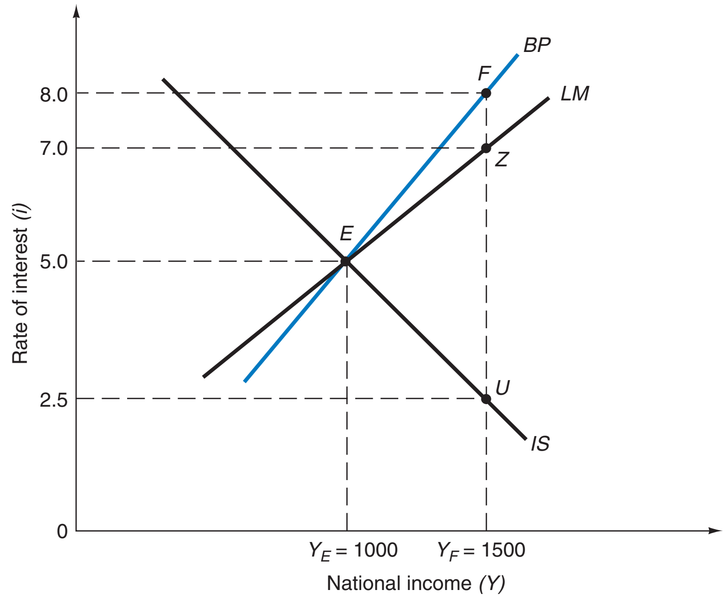

FIGURE 18.2. Equilibrium in the Goods and Money Markets and in the Balance of Payments. The *IS*, *LM*, and *BP* curves show the various combinations of interest rates and national income at which the goods market, the money market, and the nation's balance of payments, respectively, are in equilibrium. The *IS* curve is negatively inclined because lower rates of interest (and higher investments) are associated with higher incomes (and higher savings and imports) for the quantities of goods and services demanded and supplied to remain equal. The *LM* curve is positively inclined because higher incomes (and a larger transaction demand for money) must be associated with higher interest rates (and a lower demand for speculative money balances) for the total quantity of money demanded to remain equal to the given supply of money. The *BP* curve is also positively inclined because higher incomes (and imports) require higher rates of interest (and capital inflows) for the nation to remain in balance-of-payments equilibrium. All markets are in equilibrium at point *E*, where the *IS*, *LM*, and *BP* curves cross at $i = 5.0\%$, and $Y_E = 1000$. However, $Y_E < Y_F$.

goods market. The goods market is in equilibrium whenever the quantity of goods and services demanded equals the quantity supplied, or when injections into the system equal leakages, as shown by Equation (18-2). The level of investment *(I)* is now taken to be inversely related to the rate of interest *(i)*. That is, the lower the rate of interest (to borrow funds for investment purposes), the higher is the level of investment (and national income, through the multiplier process). As in Chapter 17, saving *(S)* and imports *(M)* are a positive function of, or increase in, the level of income of the nation *(Y)*, while the nation's exports *(X)*, government expenditures *(G)*, and taxes *(T)* are taken to be exogenous, or independent, of Y. With this in mind, let's see why the *IS* curve is negatively sloped.

The interest rate of $i = 5.0\%$ and national income of $Y_E = 1000$ define one equilibrium point in the goods market (point *E* on the *IS* curve). The *IS* curve is negatively inclined because at lower interest rates, the level of investment is higher so that the level of national income will also have to be higher to induce a higher level of saving and imports to once again be equal to the higher level of investment. At that point, the nation's goods market is once again in equilibrium. Exports, government expenditures, and taxes are not affected by the increase in the level of national income because they are exogenous. Thus, equilibrium in the nation's goods market is reestablished when $\Delta I = \Delta S + \Delta M$. For example, at $i = 2.5\%$, the level of investment will be higher than at $i = 5.0\%$, and the level of national income will have to be $Y_F = 1500$ (the full-employment level of income) to maintain equilibrium in the goods market (point U on the *IS* curve). At $Y < 1500$ (with $i = 2.5\%$), there is unemployment, and at $Y > 1500$ there is inflation.

The *LM* curve shows the various combinations of interest rates *(i)* and national income *(Y)* at which the demand for money is equal to the given and fixed supply of money, so that the money market is in equilibrium. Money is demanded for transactions and speculative purposes. The transaction demand for money consists of the active working balances held for the purpose of making business payments as they become due. The transaction demand for money is positively related to the level of national income. That is, as the level of national income rises, the quantity demanded of active money balances increases (usually in the same proportion) because the volume of transactions is greater. The speculative demand for money arises from the desire to hold money balances instead of interest-bearing securities. The reason for the preference for money balances is to avoid the risk of falling security prices. Furthermore, money balances will allow the holder to take advantage of possible future (financial) investment opportunities. However, the higher the rate of interest, the smaller is the quantity of money demanded for speculative or liquidity purposes because the cost (interest foregone) of holding inactive money balances is greater.

At $i = 5.0\%$ and $Y_E = 1000$, the quantity of money demanded for transaction purposes plus the quantity demanded for speculative purposes equals the given supply of money so that the money market is in equilibrium (point E on the *LM* curve). The *LM* curve is positively inclined because the higher the rate of interest (i), the smaller the quantity of money demanded for speculative purposes. The remaining larger supply of money available for transaction purposes will be held only at higher levels of national income. For example, at $r = 7.0\%$, the level of national income will have to be $Y_F = 1500$ (point Z on the *LM* curve) for the money market to remain in equilibrium. At $Y < 1500$ (and $r = 7.0\%$), the demand for money falls short of the supply of money, while at $Y > 1500$, there is an excess demand for money. To be noted is that the *LM* curve is derived on the assumption that the monetary authorities keep the nation's money supply fixed.

The *BP* curve shows the various combinations of interest rates *(i)* and national income *(Y)* at which the nation's balance of payments is in equilibrium *at a given exchange rate*. The balance of payments is in equilibrium when a trade deficit is matched by an equal net capital inflow, a trade surplus is matched by an equal net capital outflow, or a zero trade balance is associated with a zero *net* international capital flow. One point of external balance is given by point E on the *BP* curve at $i = 5.0\%$ and $Y_E = 1000$. The *BP* curve is positively inclined because higher rates of interest lead to greater capital inflows (or smaller outflows) and must be balanced with higher levels of national income and imports for the balance of payments to remain in equilibrium.

For example, at $i = 8.0\%$, the level of national income will have to be $Y_F = 1500$ for the nation's balance of payments to remain in equilibrium (point F on the *BP* curve). To the left of the *FE* curve, the nation has a balance-of-payments surplus and to the right a balance-of-payments deficit. The more responsive international short-term capital flows are to changes in interest rates, the flatter is the *BP* curve. The *BP* curve is drawn on the assumption of a constant exchange rate. A devaluation or depreciation of the nation's currency shifts the *BP* curve down since the nation's trade balance improves, and so a lower interest rate and smaller capital inflows (or greater capital outflows) are required to keep the balance of payments in equilibrium. On the other hand, a revaluation or appreciation of the nation's currency shifts the *BP* curve upward. Since we are here assuming that the exchange rate is fixed, the *BP* curve does not shift.

In Figure 18.2, the only point at which the nation is simultaneously in equilibrium in the goods market, in the money market, and in the balance of payments is at point E, where the *IS*, *LM*, and *BP* curves cross. Note that this equilibrium point is associated with an income level of $Y_E = 1000$, which is below the full-employment level of national income of $Y_F = 1500$. Also to be noted is that the *BP* curve need not cross at the $IS-LM$ intersection. In that case, the goods and money markets, but not the balance of payments, would be in equilibrium. However, a point such as E, where the nation is simultaneously in equilibrium in all three markets, is a convenient starting point to examine how the nation, by the appropriate combination of fiscal and monetary policies, can reach the full-employment level of national income (and remain in external balance) while keeping the exchange rate fixed.

18.4 Fiscal and Monetary Policies for Internal and External Balance with Fixed Exchange Rates

In this section, we first examine the effect of fiscal policy on the *IS* curve and the effect of monetary policy on the *LM* curve, and then we show how fiscal and monetary policies can be used to reach internal and external balance, starting from a position of external balance and unemployment (point E in Figure 18.2), or alternatively, starting from a condition of unemployment and deficit in the balance of payments, and finally assuming that capital flows are perfectly elastic.

18.4A Fiscal and Monetary Policies from External Balance and Unemployment

An expansionary fiscal policy in the form of an increase in government expenditures and/or a reduction in taxes (which increases private consumption) shifts the *IS* curve to the right so that at each rate of interest the goods market is in equilibrium at a higher level of national income. On the other hand, a contractionary fiscal policy shifts the *IS* curve to the left. An easy monetary policy in the form of an increase in the nation's money supply shifts the *LM* curve to the right, indicating that at each rate of interest the level of national income must be higher to absorb the increase in the money supply. On the other hand, a tight monetary policy reduces the nation's money supply and shifts the *LM* curve to the left. Monetary and fiscal policies will not directly affect the *BP* curve, and since we are here assuming that the exchange rate is fixed, the *BP* curve remains unchanged (i.e., it does not shift).

Figure 18.3 shows that the nation of Figure 18.2 can reach the full-employment level of national income or internal balance and remain in external balance by combining the *expansionary fiscal policy* that shifts the *IS* curve to the right to IS' and the *tight monetary policy* that shifts the *LM* curve to the left to LM' in such a way that broken curves IS' and LM' intersect the unchanged *BP* curve at the full-employment level of income of $Y_F = 1500$ and $i = 8.0\%$ (point F). That is, the worsened trade balance resulting from the increase in national income (an induced rise in imports) is matched by an equal increase in capital inflows (or reduction in capital outflows) as the interest rate rises to $i = 8.0\%$ so as to keep the nation's balance of payments in equilibrium.

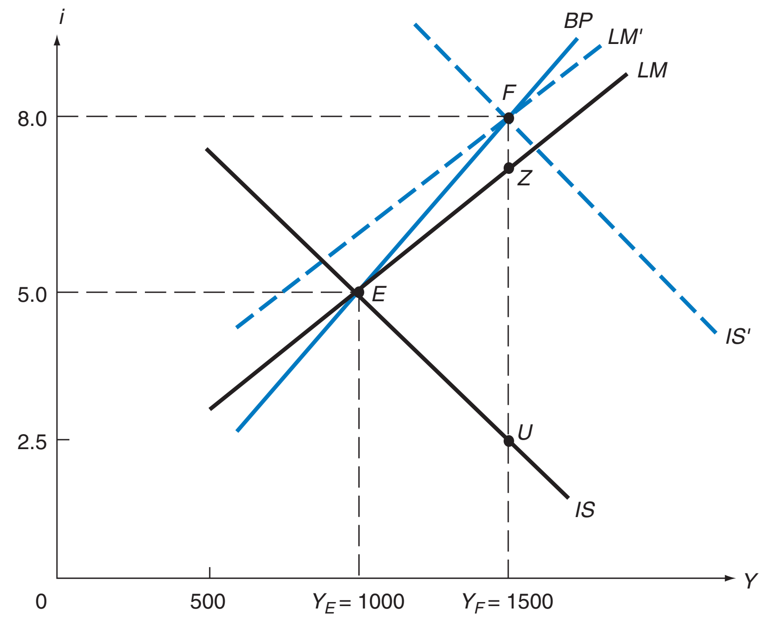

FIGURE 18.3. Fiscal and Monetary Policies from Domestic Unemployment and External Balance. Starting from point *E* with domestic unemployment and external balance, the nation can reach the full-employment level of national income of $Y_F = 1500$ with external balance by pursuing the expansionary fiscal policy that shifts the *IS* curve to the right to *IS′* and the tight monetary policy that shifts the *LM* curve to the left to *LM′*, while holding the exchange rate fixed. All three markets are then in equilibrium at point *F*, where curves *IS′* and *LM′* cross on the unchanged *BP* curve at $i = 8.0\%$ and $Y_F = 1500$.

The nation could reach the full-employment level of national income by the *easy* monetary policy that shifts the *LM* curve to the right so as to cross the unchanged *IS* curve at point *U*. However, at point *U*, the interest rate would be $i = 2.5\%$ (which is lower than $i = 5.0\%$ at point *E*), and so the worsening trade balance as income rises would be accompanied by a smaller capital inflow (or larger capital outflow) as the interest rate falls, leaving a large balance-of-payments deficit. As an alternative, the nation could reach the full-employment level of national income by the expansionary fiscal policy that shifts the *IS* curve to the right so as to cross the *LM* curve at point *Z*. At point *Z*, the interest rate is higher than at point *E* so that the worsened trade balance would be accompanied by an increased capital inflow (or reduced capital outflow). However, this increased capital inflow or reduced outflow is not sufficient to avoid a deficit in the nation's balance of payments (since point *Z* is to the right of the *BP* curve).

To reach the full-employment level of national income of $Y_F = 1500$ and also have equilibrium in its balance of payments, the nation should pursue the stronger expansionary policy that shifts the *IS* curve not to point *Z* on the *LM* curve but to point *F* on the *BP* curve (as in the figure). The tight monetary policy shown in the figure to shift the *LM* curve to *LM′*, while neutralizing part of the expansionary fiscal policy indicated by *IS′*, also causes the nation's interest rate to rise to $i = 8.0\%$ as required for external balance. Thus, two *conflicting* policies (an expansionary fiscal policy and a tight monetary policy) are required for this nation to reach internal and external balance simultaneously.

18.4B Fiscal and Monetary Policies from External Deficit and Unemployment

Figure 18.4 shows an initial situation where the *IS* and *LM* curves intersect at point *E* (as in Figures 18.2 and 18.3) but the *BP* curve does not. That is, the domestic economy is in equilibrium (with unemployment) at $i = 5.0\%$ and $Y_E = 1000$, but the nation faces a deficit in its balance of payments because point *E* is to the right of point *B* on the *BP* curve. That is, external balance requires the level of national income to be $Y = 700$ at $i = 5.0\%$ (point *B* on the *BP* curve). Since $Y_E = 1000$ instead, the nation has a deficit in its balance of payments equal to the excess level of national income of 300 $(1000 - 700)$ times the marginal propensity to import (*MPM*). If $MPM = 0.15$ (as in Chapter 17), the deficit in the nation's balance of payments is $(300)\,(0.15) = 45$ (assuming no foreign repercussions: with foreign repercussions, the balance-of-payments deficit would be smaller). At $Y_E = 1000$, the interest rate would have to be $i = 6.5\%$ (point B' on the *BP* curve) for capital inflows to be larger by 45 (or capital outflows smaller by 45) for the nation's balance of payments to be in equilibrium.

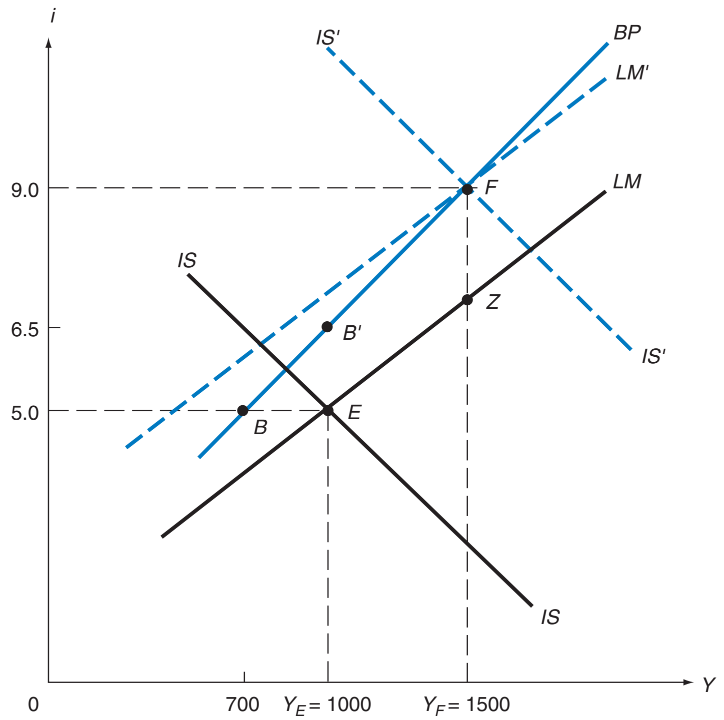

FIGURE 18.4. Fiscal and Monetary Policies from Domestic Unemployment and External Deficit. Starting from point *E* with domestic unemployment and external deficit, the nation can reach the full-employment level of national income of $Y_F = 1500$ with external balance by pursuing the expansionary fiscal policy that shifts the *IS* curve to the right to *IS*′ and the tight monetary policy that shifts the *LM* curve to the left to *LM*′, while keeping the exchange rate fixed. All three markets are then in equilibrium at point *F*, where curves *IS*′ and *LM*′ cross on the unchanged *BP* curve at $i = 9.0\%$ and $Y_F = 1500$. Because of the original external deficit, the nation now requires a higher interest rate than in Figure 18.3 to reach external and internal balance.

Starting from point E, where the domestic economy is in equilibrium with unemployment and a balance-of-payments deficit (of 45 if $MPM = 0.15$), the nation can reach the full-employment level of output of $Y_F = 1500$ with external balance by using the expansionary fiscal policy that shifts the IS curve to the right to IS' and the tight monetary policy that shifts the LM curve to the left to LM', so that the broken IS' and LM' curves cross the unchanged BP curve at $i = 9.0\%$ and $Y_F = 1500$ (point F in the figure). Note that in this case the interest rate must rise from $i = 5.0\%$ to $i = 9.0\%$ rather than to $i = 8.0\%$ (as in Figure 18.3) for the nation to also achieve external balance.

18.4c Fiscal and Monetary Policies with Elastic Capital Flows

In the previous section, we have seen that a country with domestic unemployment and an external deficit can achieve both internal and external balance simultaneously with the appropriate *expansionary* fiscal policy and *tight* monetary policy. An inspection of Figure 18.4, however, reveals that a tight monetary policy was required only because the BP curve was steeper than the LM curve and was located to the left of the LM curve at the full-employment level of national income (Y_F). This implies that international capital flows are not very responsive to changes in international interest differentials.

With the elimination of all or most controls on international capital flows among industrial countries today, however, the BP curve is likely to be much flatter than the one shown in Figure 18.4 for these countries and to be located to the right of the LM curve at the full-employment level of income, as shown in Figure 18.5. In that case, a nation that starts at point E with domestic unemployment and a balance-of-payments deficit (point B is above point E) could reach internal and external balance by adopting the *expansionary* fiscal policy that shifts the IS curve to IS' and the *easy* monetary policy that shifts the LM curve to LM', in such a way that the IS' and LM' curves intersect on the unchanged BP curve at point F, with $i = 6.0\%$ and $Y_F = 1500$. Since international capital flows are now much more elastic than in the previous case, the interest rate needs only to rise from $i = 5.0\%$ to $i = 6.0\%$, instead of from $i = 5.0\%$ to $i = 9.0\%$ as in Figure 18.4. Thus, facing domestic unemployment and an external deficit, the nation will require an expansionary fiscal policy but a tight *or* easy monetary policy to achieve both internal and external balance, depending on whether the BP curve is to the left or to the right of the LM curve at the full-employment level of national income (i.e., depending on how responsive capital flows are to interest rate differentials).

A figure similar to Figure 18.4 or 18.5 could be drawn to show any other combination of internal and external disequilibria to begin with, together with the appropriate mix of fiscal and monetary policies required to reach the full-employment level of national income with external balance and a fixed exchange rate. This type of analysis is essential not only to examine the workings of the fixed exchange rate system that prevailed from the end of World War II until 1971, but also to examine the experience of the countries of the European Union as they sought to maintain stable exchange rates on their way to a common currency (the euro introduced in January 1999) and for the many developing nations that still peg or keep their exchange rates fixed in terms of the currency of a large developed nation, a basket of currencies, or special drawing rights (SDRs). The analysis is also relevant for the United States, Japan, Canada, and the European Union (after the adoption of the euro) to the extent that they *manage* their exchange rates by inducing international capital flows. Case Study 18-2 examines the relationship between U.S. current account and budget deficits since 1980.

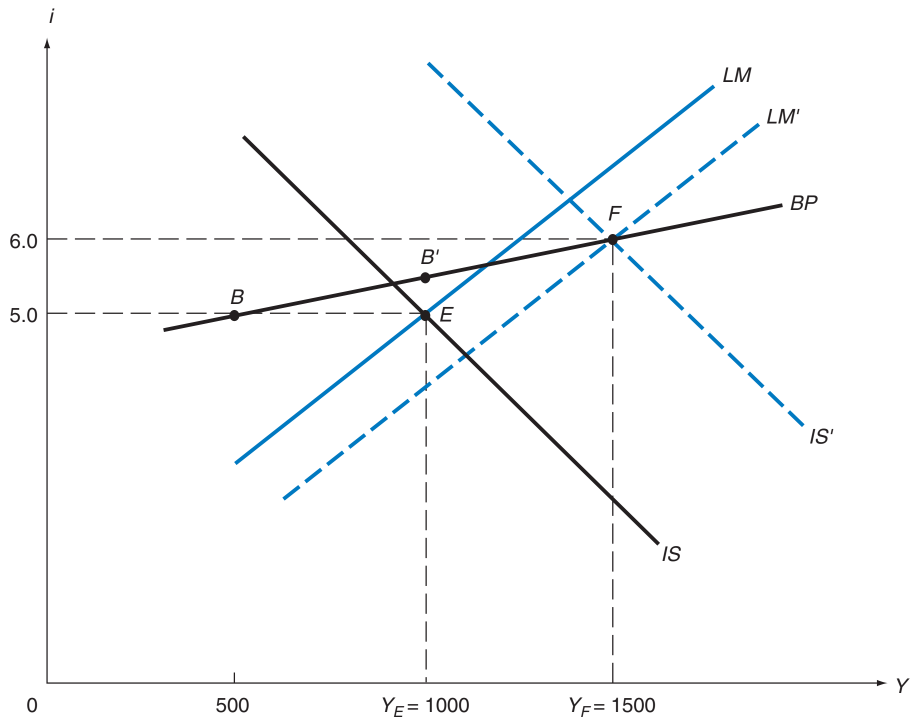

FIGURE 18.5. Fiscal and Monetary Policies with Elastic Capital Flows.
Starting from point *E* with domestic unemployment and external deficit, the nation can reach the full-employment level of national income of $Y_F = 1500$ with external balance by pursuing the expansionary fiscal policy that shifts the *IS* curve to the right to *IS*′ and the *easy* monetary policy that shifts the *LM* curve to the right to *LM*′, while keeping the exchange rate fixed. All three markets are then in equilibrium at point *F*, where curves *IS*′ and *LM*′ cross on the unchanged *BP* curve at $i = 6.0\%$ and $Y_F = 1500$.

■ CASE STUDY 18-2 Relationship between U.S. Current Account and Budget Deficits

Figure 18.6 shows that from 1980 to 1989, 2001 to 2003, and 2010 and 2011, the U.S. current account deficit and the U.S. budget deficit (the excess of all government expenditures over all taxes collected) as percentages of the U.S. gross domestic product (GDP) moved more or less together (and for that reason, they are often referred to as the *twin deficits*). This does not mean, however, that the budget deficit fully explains or causes the current account deficit because each depends on many other factors, such as rates of savings, inflation, and growth, as well as expectations about taxes, interest rates, and exchange rates in the United States and abroad. From Equation (18-3), we can see that *only if (S-I) stays the same, do (X-M) and (G-T) move together*. In fact, from 1989 to 2001 and 2003 to 2010, the U.S. current account deficit and the U.S. budget deficit moved in opposite directions, with the first rising when the second was falling, and vice versa. The United States had the largest budget deficit (11.6 percent of GDP) in 2009 and the largest current account deficit (6.0 percent of GDP) in 2006.

(continued)

■ CASE STUDY 18-2 Continued

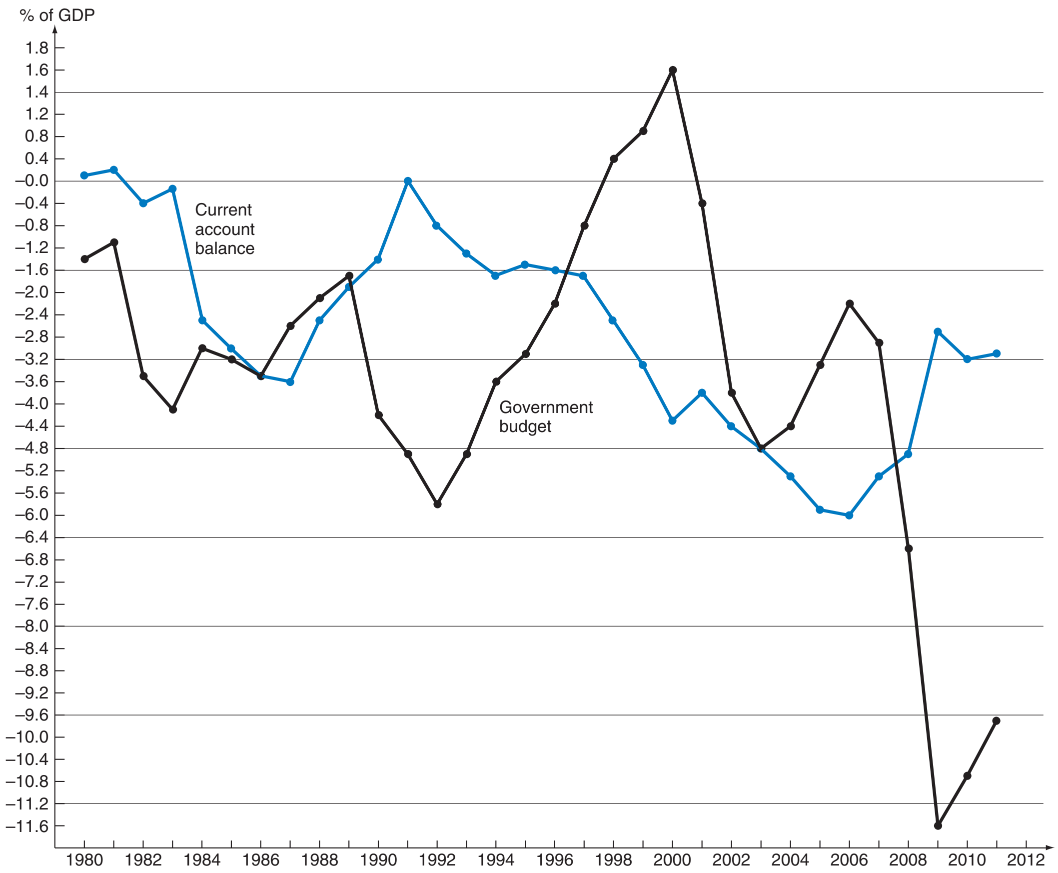

FIGURE 18.6. **U.S. Current Account and Budget Deficits as a Percentage of GDP, 1980–2012.**
From 1980 to 1989, 2001 to 2003, and 2010 to 2011, the U.S. current account deficit and the U.S. budget deficit, as a percentage of GDP, moved together as ''twins,'' but they moved in opposite direction in other years.
Sources: Organization for Economic Cooperation Development, *Economic Outlook* (Paris: OECD, December 2012); D. Salvatore, ''Twin Deficits in the G-7 Countries and Global Structural Imbalances,'' *Journal of Policy Modeling*, September 2006, pp. 701–712; and D. Salvatore, ''Global Imbalances,'' *Princeton Encyclopedia of the World Economy* (Princeton, N.J.: Princeton University Press, 2008), pp. 536–541.

18.4D Fiscal and Monetary Policies with Perfect Capital Mobility

In Figure 18.7, we return to the initial equilibrium condition where all three markets are simultaneously in equilibrium at point E (as in Figures 18.2 and 18.3), but with perfect capital mobility (so that the BP curve is now horizontal at $i = 5\%$ prevailing on the world market). This means that a small nation can borrow or lend any desired amount at 5.0 percent. The condition was particularly relevant for small Western European nations as a result of the high capital market integration that took place during the 1980s and 1990s through the Eurocurrency market. In this extreme case, a small nation can reach the

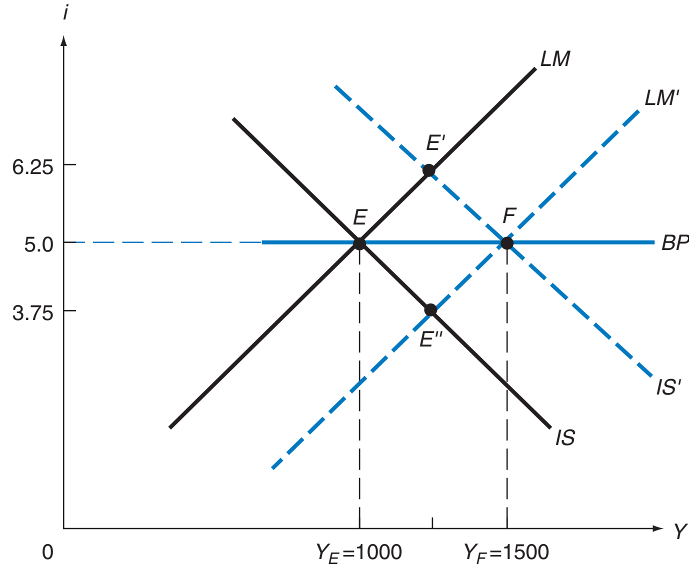

FIGURE 18.7. Fiscal and Monetary Policies with Perfect Capital Mobility and Fixed Exchange Rates. Starting from point *E* with domestic unemployment and external balance, and perfect capital mobility and a fixed exchange rate, the nation can reach the full-employment level of national income of $Y_F = 1500$ with the expansionary fiscal policy that shifts the *IS* curve to the right to *IS*′ and with the *LM* curve shifting to the right to *LM*′ because of capital inflows that the nation is unable to neutralize.

full-employment level of national income with equilibrium in its balance of payments by the appropriate fiscal policy and without any monetary policy. Indeed, in this world of perfect capital mobility and fixed exchange rates, monetary policy would be entirely ineffective. This can be shown as follows.

Starting from point E in Figure 18.7, the small nation should pursue the expansionary fiscal policy that shifts the IS curve to the right to IS' so that it crosses the horizontal BP curve at point F, at $Y_F = 1500$. The intersection of the broken IS' curve with the unchanged LM curve at point E' indicates a tendency for the nation's interest rate to rise to $i = 6.25\%$. However, because of perfect capital mobility at $i = 5.0\%$ for this small nation, there is a capital *inflow* from abroad that increases the nation's money supply (as the foreign currency is exchanged for domestic currency) and shifts the LM curve to LM'. As a result, broken curves IS' and LM' intersect at point F on the horizontal BP curve, with $i = 5.0\%$ and $Y_F = 1500$, and the nation is simultaneously in internal and external balance. In this case, it will be impossible for the small nation to prevent its money supply from increasing until the LM curve has shifted all the way to LM'. Only then will capital inflows come to an end and the nation's money supply stabilize (at the level given by LM').

If this small nation attempted to reach point F by the easy monetary policy that shifts the LM curve to the right to LM', the interest rate would tend to fall to $i = 3.75\%$ (point E'' in the figure). This would lead to capital *outflows*, which would reduce the nation's money supply to the original level and shift the LM' curve back to the original LM position. If the nation attempted to sterilize, or neutralize, the effect of these capital outflows on its money supply, it would soon exhaust all of its foreign exchange reserves, and the capital outflows would continue until the nation's money supply had been reduced to the original position given by the *LM* curve. Thus, with fixed exchange rates, monetary policy is completely ineffective if international capital flows are highly elastic, as they are likely to be, for many small industrial nations in today's world of highly integrated capital markets. Case Study 18-3 examines the effect of fiscal policy in the United States and its repercussions on the European Union and on Japan.

CASE STUDY 18-3 Effect of U.S. Fiscal Policy in the United States and Abroad

Table 18.2 shows the effect of a U.S. restrictive fiscal policy (through a combination of increase in taxes and a reduction in government expenditures) equal to 6 percent of GDP on the U.S. growth rate, inflation rate, trade balance, current account balance, and short-term interest rates, and its repercussions on the European Monetary Union (EMU) and Japan under a fixed exchange rate system. Effects are measured in relation to what would have been the case in the United States without the restrictive fiscal policy over the 2004–2009 period (baseline

TABLE 18.2. Effect of a Restrictive U.S. Fiscal Policy with Fixed Exchange Rates, 2004–2009

	Yearly Averages: 2004–2009		
	Baseline Scenario	Restrictive Fiscal Policy[a]	End Point (2009) Scenario with Respect to Baseline
United States			
Growth of real GDP[b]	3.3	2.6	−4.5
Rate of inflation[b]	1.3	1.6	1.5
Trade balance[c]	−4.7	−3.7	2.1
Current account balance[c]	−5.1	−3.8	2.6
Short-term interest rate[d]	3.9	0.0	−5.4
European Monetary Union			
Growth of real GDP[b]	2.3	2.2	−0.4
Rate of inflation[b]	1.6	1.7	1.0
Trade balance[c]	2.5	1.9	−1.4
Current account balance[c]	1.0	0.3	−1.5
Short-term interest rate[d]	3.6	2.5	−1.5
Japan			
Growth of real GDP[b]	1.6	1.3	−2.0
Rate of inflation[b]	−0.2	−0.7	−2.7
Trade balance[c]	2.6	2.2	−1.3
Current account balance[c]	5.0	4.5	−1.3
Short-term interest rate[d]	0.0	0.0	0.0

[a]Restrictive fiscal policy equal to 6 percent of U.S. GDP.
[b]Numbers in the first two columns refer to yearly average rates of change; numbers in the third columns show the *level* in 2009 relative to the baseline.
[c]Percent of GDP.
[d]Percent.
Source: Organization for Economic Cooperation and Development, *Economic Outlook* (Paris: OECD, June 2004).

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CASE STUDY 18-3 Continued

scenario). The table shows average yearly effects over the 2004–2009 period and the outcome at the end of the period (i.e., in 2009) as compared to the baseline scenario without the U.S. restrictive fiscal policy.

From the table, we see that a restrictive fiscal policy equal to 6 percent of GDP in the United States reduces the average growth rate of real GDP from 3.3 percent per year under the baseline scenario to 2.6 percent per year over the 2004–2009 period in the United States. The average inflation rate would be 1.6 percent per year instead of the 1.3 percent rate assumed in the baseline scenario, the average trade balance would be –3.7 percent of GPD instead of –4.7 percent, the average current account balance would be –3.8 percent of GDP instead of –5.1 percent, and the average short-term interest rate would be 0.0 instead of 3.9 percent. The direction of these effects are as anticipated, except for the increase in the rate of inflation (the zero interest rate also seems unrealistic).

The last column of the table shows the outcome in 2009, as compared to the baseline scenario. That is, U.S. growth would be 4.5 percent lower with respect to the baseline scenario, the price level would be 1.5 percent higher, the trade balance would be better by 2.1 percentage points (say, from –5.0 to –2.9 percent of GDP), the current account balance would improve by 2.6 percentage points in relation to GDP, and short-term interest rates would be 5.4 percent points lower (say, 7.0 instead of 1.6 percent). The U.S. restrictive fiscal policy would have repercussions on the European Monetary Union and Japan, as indicated in the bottom part of the table.

18.5 The *IS–LM–BP* Model with Flexible Exchange Rates

In this section, we utilize the *IS–LM–BP* model to examine how internal and external balance can be reached simultaneously with monetary policy under a freely flexible exchange rate system (or with exchange rate changes). In Section 18.5A we examine the case where we have imperfect capital mobility, and in Section 18.5B, the case where there is perfect capital mobility.

18.5A The *IS–LM–BP* Model with Flexible Exchange Rates and Imperfect Capital Mobility

We start from point E in Figure 18.8, where all three markets are in equilibrium with external balance and unemployment (exactly as in Figure 18.2). The government would then use the easy monetary policy that shifts the LM curve to the right to LM' so as to intersect the IS curve at point U, at $Y_F = 1500$ and $i = 2.5\%$. Since point U is to the right of the BP curve, the nation has an external deficit (because Y is higher and i is lower than at point E).

Under a flexible exchange rate system, the nation's currency depreciates and the BP curve shifts to the right. At the same time, the depreciation improves the nation's trade balance (if the Marshall–Lerner condition is satisfied), and so the IS curve shifts to the right. The depreciation will also increase domestic prices and the transaction demand for

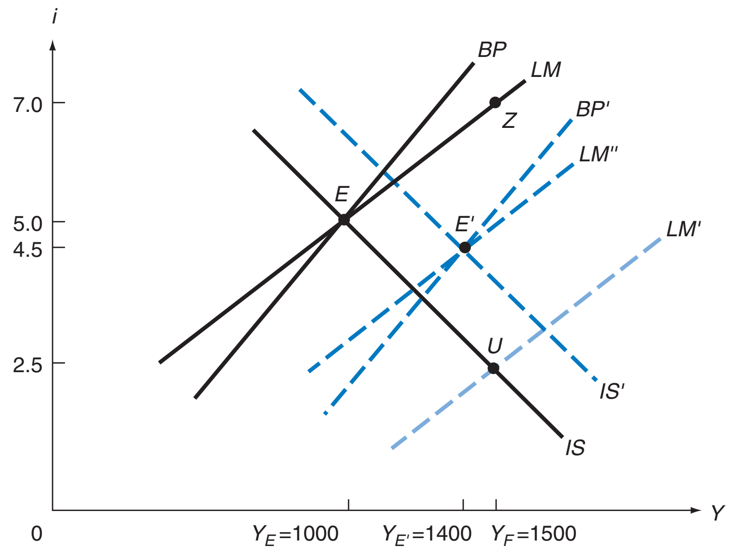


FIGURE 18.8. The *IS–LM–BP* Model with Flexible Exchange Rates.
Starting from point *E*, where all three markets are in equilibrium with an external balance and domestic unemployment, the nation could use easy monetary policy to shift the *LM* curve to the right to *LM′* so as to cross the *IS* curve at point *U* and reach the full-employment level of income of $Y_F = 1500$. However, since point *U* is to the right of the *BP* curve, the nation has an external deficit. With flexible exchange rates, the nation's currency depreciates and this causes the *BP* and *IS* curves to shift to the right and the *LM′* curve to the left until curves *BP′*, *IS′*, and *LM″* cross at a point such as *E′*, with $Y_{E'} = 1400$. The process can be repeated with additional doses of easy monetary policy until all three markets are in equilibrium at $Y_F = 1500$.

money and shift the LM' curve to the left (as the *real* money supply declines as a result of rising domestic prices). Equilibrium will be reestablished in all three markets where curves IS' and LM'' intersect on the BP' curve at a point such as E', with $Y_{E'} = 1400$ and $i = 4.5\%$. The process can be repeated with additional doses of easy monetary policy until all three markets are in equilibrium at the full-employment level of national income of $Y_F = 1500$. Note that with flexible exchange rates, equilibrium in all three markets will always be on the BP curve, but now the BP curve also will shift.

The analysis is analogous if, in order to reach the full-employment level of national income from point E, the nation uses the expansionary fiscal policy that shifts the IS curve to the right so as to cross the LM curve at point Z. Since point Z is to the right of the BP curve, the nation will have a deficit in its balance of payments. With flexible exchange rates, the nation's currency depreciates and the BP curve shifts to the right. This induces a rightward shift in the IS curve and a leftward shift in the LM curve, until the IS and LM curves intersect on the BP curve and all three markets are simultaneously in equilibrium. Note that the nation may need to apply additional doses of expansionary fiscal policy to reach the full-employment level of national income of $Y_F = 1500$. (You are asked to draw this figure in Problem 10.)

If the BP curve had been to the right of point Z to begin with, the nation's currency would appreciate and this would cause opposite shifts in the BP, IS, and LM curves until all three markets are simultaneously in equilibrium at the full-employment level of national income (see Problem 11, with answer at the end of the book). Note, however, that in either case (i.e., whether the *BP* curve is steeper or flatter than the *LM* curve) when a nation starts with an easy monetary policy rather than with an expansionary fiscal policy, it ends up with a lower interest rate, which is a stimulus to long-run growth. What is important is that by using expenditure-changing (i.e., monetary and/or fiscal) policies to achieve internal balance, the nation will have to allow the exchange rate to vary or engage in expenditure-switching policies to achieve external balance simultaneously. We are then back to the analysis in Section 18.2 and the Swan diagram of Figure 18.1.

18.5B The *IS–LM–BP* Model with Flexible Exchange Rates and Perfect Capital Mobility

Starting at point E in Figure 18.9 (the same as in Figure 18.7), with domestic unemployment and external balance, perfect capital mobility and flexible exchange rates, suppose that the nation uses the expansionary fiscal policy that shifts the IS curve to IS', which intersects the BP curve at point F at $Y_F = 1500$. The intersection of the broken IS' curve with the unchanged LM curve at point E' indicates a tendency for the nation's interest rate to

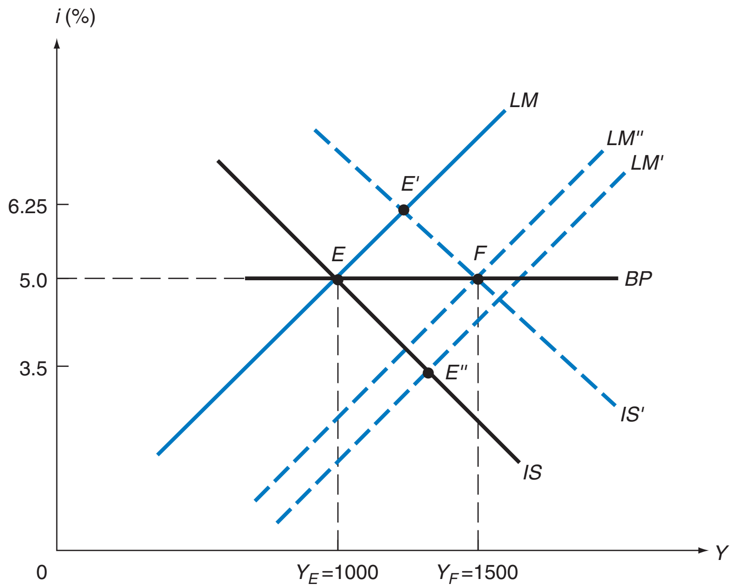


FIGURE 18.9. Adjustment Policies with Perfect Capital Flows and Flexible Exchange Rates.
Starting from point E with domestic unemployment and external balance, and perfectly elastic capital flows and flexible exchange rates, the nation can reach the full-employment level of national income of $Y_F = 1500$ with the easy monetary policy that shifts the LM curve to the right to LM'. This causes the IS curve to shift to the right to IS' (because the tendency of the currency to depreciate improves the nation's trade balance) and the LM' curve back part of the way to LM'' (because of the reduction in the real money supply resulting from the increase in domestic prices). The final equilibrium is at point F where the IS' and LM'' curves cross on the BP curve at $Y_F = 1500$.

rise to $i = 6.25\%$. This leads to massive capital inflows and appreciation of the nation's currency, which discourages exports and encourages imports, and shifts the IS' curve to the left and back to its original IS position. Thus, with flexible exchange rates and perfect capital mobility, fiscal policy is completely ineffective at influencing the level of national income.

On the other hand, starting from point E, an easy monetary policy that shifts the LM curve to LM' tends to lower the interest rate in the nation (see point E'' where the LM' curve intersects the IS curve). This would lead to a capital outflow and a tendency of the nation's currency to depreciate, which shifts the IS curve to the right to IS' (as exports are stimulated and imports discouraged) and the LM' curve a little back to the left to LM'' (as the real money supply falls because of rising prices in the nation) in such a way that the IS' and LM'' curves cross on the BP curve at point F at $Y_F = 1500$. Now the nation achieves internal and external balance with monetary policy only. Note that we made the LM' curve cross the BP curve a little to the right of $Y_F = 1500$ in order to accommodate the subsequent leftward shift of the LM' curve to LM'' and show final equilibrium point F at $Y_F = 1500$. Thus, with perfect capital mobility, monetary policy is effective and fiscal policy ineffective with flexible exchange rates, while fiscal policy is effective and monetary policy ineffective with fixed exchange rates.

The IS–LM–BP model has been the "workhorse" of economic policy formulation for open economies during the past four decades. One serious criticism levied against the model is that it mixes stock and flows. In particular, the LM curve is based on the *stock* of money, while the BP curve is based on the *flow* of capital. Mixing stock and flows is never a good idea. In this context, the model assumes that a rise in domestic interest rates will lead to a continuous capital inflow from abroad to finance the nation's balance-of-payments deficit. The capital inflow, however, is likely to be of a once-and-for-all type and to come to an end after investors have readjusted their portfolios following the increase in the domestic interest rate. Case Study 18-4 examines the effect of monetary policy in the United States and other OECD nations under flexible exchange rates.

CASE STUDY 18-4 Effect of Monetary Policy in the United States and Other OECD Countries

Table 18.3 shows the effect of a 4 percent increase in the money supply (expansionary monetary policy) in the United States or in other OECD countries on the gross national product (GNP), consumer price index (CPI), interest rate, currency value, and current account of the United States and other OECD countries. The OECD—the Organization for Economic Cooperation and Development—included all 24 of the world's industrial countries at the time of the exercise. The simulation results were obtained by using the Multi-Country Model of the Federal Reserve Board. Although the effects of an increase in the money supply are felt over several years, the results reported in Table 18.3 show the effect in the second year after the money supply increased.

Part A of the table shows that a 4 percent increase in the U.S. money supply results (through the multiplier process) in a 1.5 percent increase in U.S. GNP the year after the United States increased its money supply. A longer period of time would show a larger total effect. It also leads to a 0.4 percent increase in the U.S. prices, a 2.2 percentage points decline (say, from 6.2 percent to 4.0 percent) in the U.S. short-term interest rate, a 6.0 percent decrease in the international value of the

(continued)

CASE STUDY 18-4 Continued

dollar (depreciation), and a \$3.1 billion deterioration in the U.S. current account balance (because the tendency of U.S. imports to rise due to higher GNP overwhelms the tendency of the dollar depreciation to improve the U.S. current account).

The top right part of the table shows that the increase in the U.S. money supply leads to a reduction in the growth of GNP in the rest of the OECD countries of 0.7 percent, a 0.6 percent fall in prices, a 0.5 percentage point reduction in the short-run interest rate, and a deterioration in the current account balance of \$3.5 billion. The effect on the foreign exchange rates of the rest of OECD was not estimated. The reduction in the GNP of the rest of the world may seem strange in view of the increase in U.S. imports. But the increase in U.S. imports may be coming from the rest of the world (developing and OPEC countries) rather than from other OECD countries. Furthermore, the repercussions of an expansionary monetary policy in the United States do not operate only through trade and are too intricate to evaluate by logical reasoning alone. That's why we need a model.

Part B of the table shows that a 4 percent increase in the money supply in the rest of OECD would lead to a 1.5 percent increase in the average GNP, a 0.6 percent increase in prices, a 2.1 percentage point reduction in the short-term interest rate, a 5.4 percent currency depreciation, and a \$3.5 billion improvement in the current account balance of the rest of OECD. These changes have repercussions in the United States, where prices fall by 0.2 percent, short-term interest rates decrease by 0.2 percentage points, and the U.S. current account improves by \$0.1 billion. The net effect on U.S. GNP is nil, and the effect on the exchange rate of the dollar was not estimated.

TABLE 18.3. Estimated Effect in the Second Year of an Increase in the Money Supply by 4 Percent

A. An Increase in the Money Supply in the United States

	Effect in the United States	Effect in the Rest of OECD
GNP	1.5%	−0.7%
CPI	0.4%	−0.6%
Interest rate	−2.2%[a]	−0.5%[a]
Currency value	−6.0%	—
Current account	−\$3.1 billion	−\$3.5 billion

B. An Increase in the Money Supply in the Rest of the OECD

	Effect in the Rest of OECD	Effect in the United States
GNP	1.5%	0.0%
CPI	0.6%	−0.2%
Interest rate	−2.1%[a]	−0.2%[a]
Currency value	−5.4%	—
Current account	\$3.5 billion	\$0.1 billion

[a]Percentage point change.

Source: R. Bryant, D. Henderson, G. Holtham, P. Hooper, and S. Symansky, eds., *Empirical Macroeconomics for Interdependent Economies* (Washington, D.C.: Brookings Institution, 1988), p. 23.

18.6 Policy Mix and Price Changes

In this section, we first examine the reasons for directing fiscal policy to achieve internal balance and monetary policy to achieve external balance. Then we evaluate the effectiveness of this policy mix and the problem created by allowing for cost-push inflation. Finally, we summarize the policy-mix experience of the United States and the other leading industrial nations during the postwar period.

18.6A Policy Mix and Internal and External Balance

In Figure 18.10, movements along the horizontal axis away from the origin refer to *expansionary* fiscal policy (i.e., higher government expenditures and/or lower taxes), while movements along the vertical axis away from the origin refer to *tight* monetary policy (i.e., reductions in the nation's money supply and increases in its interest rate).

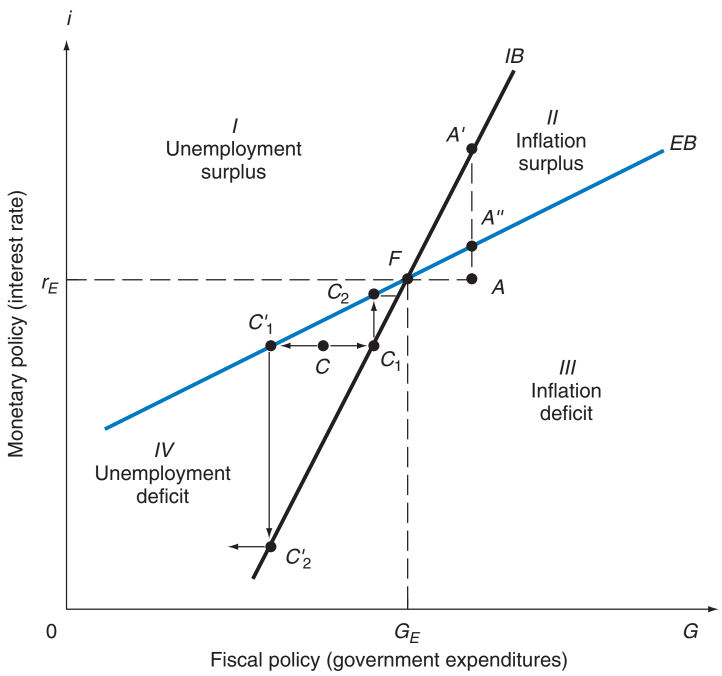


FIGURE 18.10. Effective Market Classification and the Policy Mix.
Moving to the right on the horizontal axis refers to expansionary fiscal policy, while moving upward along the vertical axis refers to tight monetary policy and higher interest rates. The various combinations of fiscal and monetary policies that result in internal balance are given by the *IB* line, and those that result in external balance are given by the *EB* line. The *EB* line is flatter than the *IB* line because monetary policy also induces short-term international capital flows. Starting from point *C* in zone IV, the nation should use expansionary fiscal policy to reach point C_1 on the *IB* line and then tight monetary policy to reach point C_2 on the *EB* line, on its way to point *F*, where the nation is simultaneously in internal and external balance. If the nation did the opposite, it would move to point C'_1 on the *EB* line and then to point C'_2 on the *IB* line, thus moving farther and farther away from point *F*.

The *IB* line in the figure shows the various combinations of fiscal and monetary policies that result in internal balance (i.e., full employment with price stability) in the nation. The *IB* line is positively inclined because an *expansionary* fiscal policy must be balanced by a *tight* monetary policy of a sufficient intensity to maintain internal balance. For example, starting at point *F* in Figure 18.10, an increase in government expenditures that moves the nation to point *A* leads to excess aggregate demand, or demand-pull inflation. This can be corrected or avoided by the tight monetary policy and higher interest rate that moves the nation to point A' on the *IB* line. A tight monetary policy that leaves the nation's interest rate below that indicated by point A' does not eliminate the excess aggregate demand entirely and leaves some inflationary pressure in the nation. On the other hand, a tighter monetary policy and higher interest rate that moves the nation above point A' not only eliminates the inflation created by the increase in government expenditures but leads to unemployment. Thus, to the right of and below the *IB* line there is inflation, and to the left of and above there is unemployment.

On the other hand, the *EB* line shows the various combinations of fiscal and monetary policies that result in external balance (i.e., equilibrium in the nation's balance of payments). Starting from a point of external balance on the *EB* line, an expansionary fiscal policy stimulates national income and causes the nation's trade balance to worsen. This must be balanced with a tight monetary policy that increases the nation's interest rate sufficiently to increase capital inflows (or reduce capital outflows) for the nation to remain in external balance. For example, starting from point *F* on the *EB* line, an expansionary fiscal policy that moves the nation to point *A* leads to an external deficit, which can be corrected or avoided by the tight monetary policy and higher interest rate that moves the nation to point A'' on the *EB* line. As a result, the *EB* line is also positively inclined. A monetary policy that moves the nation to a point below point A'' leaves an external deficit, while a tighter monetary policy that moves the nation above point A'' leads to an external surplus. Thus, to the right of and below the *EB* line there is an external deficit, and to the left of and above there is an external surplus.

Only at point *F*, where the *IB* and *EB* lines cross, will the nation be at the same time in internal and external balance. The crossing of the *IB* and *EB* curves in Figure 18.10 defines the four zones of internal and external imbalance. Note that the *EB* line is flatter than the *IB* line. This is always the case whenever short-term international capital flows are responsive to international interest differentials. This can be explained as follows. Expansionary fiscal policy raises national income and increases the transaction demand for money in the nation. If monetary authorities increase the money supply sufficiently to satisfy this increased demand, the interest rate will remain unchanged. Under these circumstances, fiscal policy affects the level of national income but not the nation's interest rate. On the other hand, monetary policy operates by changing the money supply and the nation's interest rate. The change in the nation's interest rate affects not only the level of investment and national income (through the multiplier process) but also international capital flows. As a result, monetary policy is more effective than fiscal policy in achieving external balance, and so the *EB* line is flatter than the *IB* line.

Following the *principle of effective market classification*, monetary policy should be assigned to achieve external balance and fiscal policy to achieve internal balance. If the nation did the opposite, it would move farther and farther away from internal and external balance. For example, if from point C in Figure 18.10, indicating unemployment and a deficit (zone IV), the nation used a contractionary fiscal policy to eliminate the external deficit and moved to point C'_1 on the EB line, and then used an easy monetary policy to eliminate unemployment and moved to point C'_2 on the IB line, the nation would move farther and farther away from point F. On the other hand, if the nation appropriately used an expansionary fiscal policy to reach point C_1 on the IB line, and then used a tight monetary policy to reach point C_2 on the EB line, the nation would move closer and closer to point F. In fact, the nation could move from point C to point F in a single step by the appropriate mix of expansionary fiscal and contractionary monetary policies (as in the IS–LM–BP models in Figures 18.3 and 18.4). The nation could similarly reach point F from any other point of internal and external imbalance by the appropriate combination of fiscal and monetary policies. This is left as end-of-chapter problems.

The more responsive international short-term capital flows are to interest rate differentials across nations, the flatter is the EB line in relation to the IB line. On the other hand, if short-term capital flows did not respond at all to interest differentials, the EB line would have the same slope as (and coincide with) the IB line so that no useful purpose could be served by separating fiscal and monetary policies as was done above. In that case, the nation could not achieve internal and external balance at the same time without also changing its exchange rate. This would bring us back to the case examined in Section 18.2.

18.6B Evaluation of the Policy Mix with Price Changes

The combination of fiscal policy to achieve internal balance and monetary policy to achieve external balance with a fixed exchange rate faces several criticisms. One of these is that short-term international capital flows may not respond as expected to international interest rate differentials, and their response may be inadequate or even erratic and of a once-and-for-all nature rather than continuous (as assumed by Mundell). According to some economists, the use of monetary policy merely allows the nation to *finance* its deficit in the *short run*, unless the deficit nation continues to tighten its monetary policy over time. Long-run adjustment may very well require exchange rate changes, as pointed out in Section 18.2.

Another criticism is that the government and monetary authorities do not know precisely what the effects of fiscal and monetary policies will be and that there are various lags—in recognition, policy selection, and implementation—before these policies begin to show results. Thus, the process of achieving internal and external balance described in Section 18.6A using Figure 18.10 is grossly oversimplified. Furthermore, in a nation such as the United States, it is difficult to coordinate fiscal and monetary policies because fiscal policy is conducted by one branch of the government while monetary policy is determined by the semiautonomous Federal Reserve Board. However, the nation may still be able to move closer and closer to internal and external balance on a step-by-step basis (as indicated by the arrows from point C in Figure 18.10) if fiscal authorities pursue only the objective of internal balance and disregard the external imbalance, and if monetary authorities can be persuaded to pursue only the goal of external balance without regard to the effect that monetary policies have on the internal imbalance.

Another difficulty arises when we relax the assumption that prices remain constant until the full-employment level of national income is reached. Until the 1990s, prices usually started to rise well before full employment was attained and rose faster as the economy neared full employment. (The controversial inverse relationship, or trade-off, between the rate of unemployment and the rate of inflation is summarized by the Phillips curve.) With price increases or inflation occurring even at less than full employment, the nation has at least three objectives: full employment, price stability, and equilibrium in the balance of payments, thus requiring three policies to achieve all three objectives completely. The nation might then have to use fiscal policy to achieve full employment, monetary policy to achieve price stability, and exchange rate changes to achieve external balance. In unusual circumstances, the government may also impose direct controls to achieve one or more of its objectives when other policies fail. These are examined in the next section. During the 1990s, globalization changed all that as firms resisted price increases because of increased international competition and workers refrained from demanding wage increases even when the economy was at full employment for fear of losing their jobs.

Modern nations also have as a fourth objective an “adequate” rate of growth, which usually requires a low long-term interest rate to achieve. The nation may then attempt to “twist” the interest rate structure (i.e., change the relationship that would otherwise prevail between short-term and long-term interest rates), keeping long-term interest rates low (as required by the growth objective) and allowing higher short-term interest rates (as may be required for price stability or external balance). Monetary authorities may try to accomplish this by open market sales of treasury bills (to depress their price and raise short-term interest rates) and purchases of long-term bonds (to increase their price and lower long-term interest rates). There is some indication that the United States tried to do this during the early 1960s but without much success.

18.6c Policy Mix in the Real World

If we look at the policy mix that the United States and the other leading industrial nations actually followed during the fixed exchange rate period of the 1950s and 1960s, we find that most of these nations generally used fiscal and monetary policies to achieve internal balance and switched their aims only when the external imbalance was so serious that it could no longer be ignored. Even then, these nations seemed reluctant to use monetary policy to correct the external imbalance and instead preferred using direct controls over capital flows (discussed in the next section). During this period, the United Kingdom and France were forced to devalue their currencies, while Germany had to revalue the mark. Canada, unable to maintain a fixed exchange rate, allowed its dollar to fluctuate.

During the period of flexible but managed exchange rates since 1971, the leading nations seemed content, for the most part, to leave to the exchange rate the function of adjusting to external imbalances and generally directed fiscal and monetary policies to achieve internal balance. Indeed, during the oil crisis of the 1970s, nations even attempted to manage the exchange rate to support their efforts to contain domestic inflationary pressures. However, since financial markets were subject to rapidly changing expectations and adjusted much more quickly than real markets (e.g., exports and imports), there was a great deal of volatility and overshooting of exchange rates about equilibrium rates. As inflationary pressures subsided during the first half of the 1980s, the leading nations generally continued to direct fiscal and monetary policies to achieve internal balance but (except for the United States) sometimes switched monetary policy toward the external imbalance as they attempted to manage their exchange rates.

By 1985, it became evident that the dollar was grossly overvalued and showed no tendency to drop in value as a result of purely market forces. The huge *budget* deficit of the United States kept real interest rates higher in the United States than abroad, and this attracted very large capital inflows to the United States, which resulted in a large overvaluation of the dollar, huge trade deficits, and calls for protectionism (see Section 13.5). The United States then organized a coordinated international effort with the other four leading industrial nations (Germany, Japan, France, and England) to intervene in foreign exchange markets to correct the overvaluation of the dollar. From 1986 to 1991, the United States advocated a simultaneous equal and coordinated reduction in interest rates in the leading nations so as to stimulate growth and reduce unemployment without directly affecting trade and capital flows.

From its peak in February 1985, the dollar depreciated more or less continuously until 1988, but the U.S. current account deficit did not begin to improve until the end of 1987 (refer to Figure 16.6). In 1990 and 1991, reunified Germany pushed its interest rates up to avoid inflationary pressures at home, encourage domestic savings, and attract foreign capital to help finance the rebuilding of East Germany, while the United States and other industrialized countries of Europe lowered their interest rates to fight weak economies and recession. Thus, the leading industrial countries continued to give priority to their internal balance and to direct monetary policy to achieve internal rather than external balance.

From 1992 to 1997, interest rates were reduced in Europe in order to stimulate anemic growth after the deep recession of the early 1990s, but increased in the United States in order to contain inflationary pressures in the face of relatively rapid growth. From 1997 to 2000, growth and interest rates were much higher in the United States than in Europe and Japan, and the United States received huge inflows of foreign financial capital and direct investments, which led to growing dollar appreciation and trade deficits. In 2001, the high-tech bubble burst and the United States fell into a recession. From 2001 to 2003, the Fed sharply reduced the interest rate to 1 percent (the lowest in 40 years) and President Bush pushed a huge budget stimulus package.

With resumption of rapid growth in the United States in 2004, the Federal Reserve Bank (or the Fed) and the European Central Bank started raising interest rates in 2006 and 2007 in order to contain growing inflationary pressures. But then the the Fed and the European Central Bank (ECB) reversed course and cut interest rates sharply in 2008 and 2009 (the Fed almost to zero) and introduced huge stimulus packages to combat the deep recession that resulted from the global financial crisis. Economic recovery, however, remained slow in 2010 and 2011 (this is discussed in detail in Section 21.6). From 2006, the huge U.S. current account deficit began to decline as a result of the depreciation of the dollar from 2002 (see Figure 16.6). Case Study 18-5 provides an overview of U.S. monetary and fiscal policies since 2000, while Case Study 18-6 shows that the recession would have been much deeper without the strong fiscal and monetary action undertaken by the U.S. government and the Fed.

CASE STUDY 18-5 U.S. Monetary and Fiscal Policies during the Past Decade

Table 18.4 presents U.S. macroeconomic data that summarize the course of U.S. monetary policy (measured by the growth rate of the money supply) and fiscal policy (measured by the budget balance) and their effects on other macro variables from 2000 to 2011. The first row shows that the United States experienced rapid growth in 2000, faced a mild recession in 2001 (but nevertheless managed a small positive growth for the year as a whole), saw slow growth in 2002, and experienced relatively high growth from 2003 to 2006. Growth slowed as a result of the subprime housing mortgage crisis in 2007 and was negative (but close to zero) in 2008 as the United States entered the deep recession of 2009, followed by very slow recovery in 2010 and 2011.

The second row of Table 18.4 shows a negative growth of the money supply in 2000 when the Federal Reserve Bank (the government institution entrusted with the conduct of monetary policy in the United States) wrongly thought that the problem facing the U.S. economy was a resurgence of inflation. With recession hitting the U.S. economy instead, the Fed reversed course and increased the money supply very rapidly in 2001, and again in 2003 and 2004 to stimulate growth. With rapid growth resuming in 2004 and the danger of inflation arising from the sharp increase in the price of petroleum and other primary commodities in 2006 and 2007, however, the Fed sharply reduced the growth of the money supply (which was actually negative in 2005 and 2006). In 2008, it again quickly changed course and rapidly expanded the money supply to combat the financial crisis that started in 2007, the 2008–2009 recession, and slow growth in 2010 and 2011.

The budget surplus in 2000 (shown in the third row) gave way to budget deficits, which reached 5.0 percent of GDP in 2003, primarily as the result of the drastic tax cut legislated in 2001–2003 and the cost of the Iraqi war. The budget deficit increased to 6.6 percent of GDP in 2008 and to the all-time high for the postwar period of 11.6 percent of GDP in 2009 as a result of the huge stimulus package to counter the deep recession. Row 4 shows that, as expected, the short-term interest rate moved inversely to the rate of growth of the money supply, except in 2002, 2007, and 2009. The relationship between the current account and the exchange rate was examined in Case Study 16.4, while that between the budget deficit and the current account was discussed in Case Study 18-2.

TABLE 18.4. U.S. Macroeconomic Data, 2000–2011

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
1. Growth of real GDP (percent per year)	4.1	1.1	1.7	2.5	3.5	3.1	2.7	1.9	−0.3	−3.5	3.0	1.7
2. Growth of money supply (percent per year)	−3.1	8.7	3.2	7.1	5.4	−0.1	−0.6	0.5	16.7	5.7	8.2	18.6
3. Budget balance (as a percentage of GDP)	1.5	−0.6	−4.0	−5.0	−4.4	−3.3	−2.2	−2.9	−6.6	−11.6	−10.7	−9.7
4. Interest rate (percent per year)	6.5	3.7	1.8	1.2	1.6	3.5	5.2	5.3	3.2	0.9	0.5	0.4
5. Inflation rate (percent per year)	3.4	2.8	1.6	2.3	2.7	3.4	3.2	2.9	3.8	−0.3	1.6	3.1
6. Effective exchange rate (foreign currencies per dollar, 2000 = 100)	100.0	105.3	105.8	99.6	95.1	92.6	91.0	87.0	84.0	88.7	85.4	81.4
7. Current account balance (as percentage of GDP)	−4.2	−3.9	−4.3	−4.7	−5.3	−5.9	−6.0	−5.1	−4.7	−2.7	−3.2	−3.1

Sources: Organization for Economic Cooperation and Development, *Economic Outlook* (Paris: OECD, May 2012) and International Monetary Fund, *International Financial Statistics* (Washington, D.C.: 2012).

CASE STUDY 18-6 Deeper U.S. Recession without Strong Fiscal and Monetary Measures

The United States and most other advanced and emerging market economies adopted very strong fiscal and monetary measures to overcome the 2008–2009 financial and economic crisis. Without those measures, the great recession would have been deeper and lasted longer.

Figure 18.11 shows the level of U.S. real GDP under four different scenarios: (1) the baseline scenario (the top line), which includes the effect of the strong stimulus package and powerful financial measures (huge expansion of liquidity) undertaken by the United States to combat the great recession of 2009; (2) the scenario using only financial measures (the second from the top line); (3) the scenario using only the stimulus package (the third from the top line); and (4) the scenario using neither the stimulus package or financial measures to counter the deep recession (the bottom line). Scenarios 2 and 3 show that U.S. real GDP would have fallen more and longer; scenario 4 indicates that the U.S. recession would not only have been much deeper but would have continued into 2010.

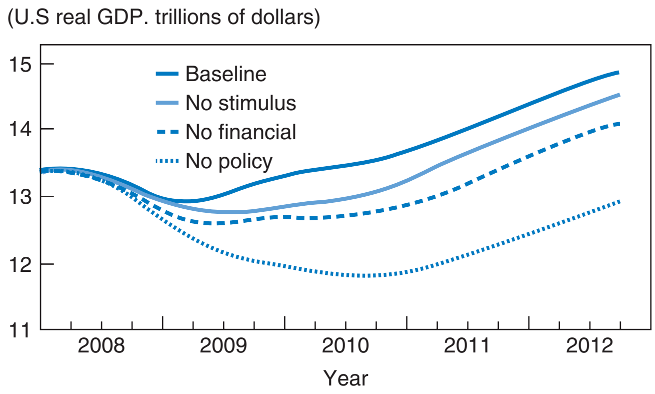


FIGURE 18.11. Fiscal and Financial Measures in the U.S. Recession.
The top line shows the change in U.S. real GDP from 2008 to 2012 with the stimulus package and financial measures to combat the 2008–2009 recession. The second and third lines from the top are, respectively, the scenarios with only financial measures and only the stimulus package. The bottom line is the scenario without any measure.
Source: U.S. Bureau of Economic Analysis, 2010.

18.7 Direct Controls

Direct controls to affect the nation's balance of payments can be subdivided into trade controls (such as tariffs, quotas, and other quantitative restrictions on the flow of international trade), financial or exchange controls (such as restrictions on international capital flows and multiple exchange rates), and others. In general, trade controls are both less important and less acceptable than exchange controls. Direct control can also take the form of price and wage controls in an attempt to restrain domestic inflation when more general policies have failed.

18.7A Trade Controls

One of the most important trade or commercial controls is the import tariff. This increases the price of imported goods to domestic consumers and stimulates the domestic production of import substitutes. On the other hand, export subsidies make domestic goods cheaper to foreigners and encourage the nation's exports. In general, an import tariff and an export subsidy of a given percentage applied across the board on all commodities are equivalent to a devaluation of the nation's currency by the same percentage. However, import duties and export subsidies are usually applied to specific items rather than across the board. As pointed out in Chapter 9, we can always find an import tariff equivalent to an import quota. Both are expenditure-switching policies, just as a devaluation is, and both stimulate domestic production. In general, nations today are not allowed to impose new import tariffs and quotas except temporarily, when in serious balance-of-payments difficulties.

Another trade control, frequently applied today by developing nations but also used by some developed nations in the past, is the requirement that the importer make an advance deposit at a commercial bank of a sum equal to the value or a fraction of the value of the goods he wishes to import, for a period of time of varying duration and at no interest. This has the effect of increasing the price of imports by the interest foregone on the sum deposited with the commercial bank, and it also discourages imports. The nation can impose an advance deposit of a different amount and length of time on each type of commodity. Advance deposits are thus flexible devices, but they can be difficult and costly to administer. A deficit nation may also impose restrictions on foreign travel and tourist expenditures abroad. A detailed discussion of trade controls and their welfare effects was presented in Chapter 9.

18.7B Exchange Controls

Turning to financial, or exchange controls, we find that developed nations sometimes impose restrictions on capital exports when in balance-of-payments deficit and on capital imports when in surplus. For example, in 1963 the United States imposed the Interest Equalization Tax on portfolio capital exports and voluntary (later mandatory) restraints on direct investments abroad to reduce its balance-of-payments deficit. However, while this improved the U.S. capital account, it certainly reduced U.S. exports and the subsequent return flow of interest and profit on U.S. foreign investments with an uncertain net effect on the overall balance of payments.

On the other hand, West Germany and Switzerland sought to discourage capital imports by allowing lower or no interest on foreign deposits in the face of large balance-of-payments surpluses and in order to insulate their economies from worldwide inflationary pressures. In the late 1960s and early 1970s, France and Belgium established a two-tier foreign exchange market and allowed the exchange rate on capital transactions to fall (i.e., the "financial franc" to appreciate) as a result of large capital inflows, while keeping the exchange rate higher on current account transactions (i.e., on the "commercial franc") in order not to discourage their exports and encourage their imports. Italy adopted a two-tier foreign exchange market for many years after the collapse of the Bretton Woods System in 1971, even though it was administratively difficult and costly to keep the two markets apart.

In addition, developed nations facing balance-of-payments surpluses and huge capital inflows often engage in forward sales of their currency to increase the forward discount and discourage capital inflows. On the other hand, deficit nations often engage in forward purchases of their currency to increase the forward premium on their currency and discourage capital outflows. The funds for such forward purchases are often borrowed from surplus nations. For example, under the General Arrangements to Borrow negotiated within the framework of the International Monetary Fund in 1962 (and renewed several times subsequently), the Group of Ten most important industrial nations (the United States, the United Kingdom, West Germany, Japan, France, Italy, Canada, the Netherlands, Belgium, and Sweden) agreed to lend up to $30 billion to any member of the group facing large short-term capital outflows (see Section 21.4B). With the rapid globalization and integration of capital markets that took place during the 1980s and 1990s, however, developed nations abolished most restrictions on international capital flows.

Most developing nations, on the other hand, have some type of exchange controls. The most common is multiple exchange rates, with higher exchange rates on luxury and nonessential imports and lower rates on essential imports. The higher exchange rate on luxuries and nonessentials makes these foreign products more expensive to domestic buyers and discourages their importation, while the lower exchange rate on essential imports (such as capital equipment deemed necessary for development) makes these products cheaper to domestic users and encourages their importation. An extreme form of exchange control requires exporters and other earners of foreign exchange to turn in all their exchange earnings to monetary authorities, who then proceed to allocate the available supply of foreign exchange to importers through import licenses and at various rates, depending on how important the monetary authorities consider the particular import commodity to be. This, however, encourages black markets, transfer pricing (i.e., under- or over-invoicing—see Section 12.5A), and corruption. Case Study 18-7 summarizes the prevalence of exchange controls among the members of the International Monetary Fund in 2011.

18.7C Other Direct Controls and International Cooperation

Government authorities have sometimes imposed direct controls to achieve a purely domestic objective, such as inflation control, when more general policies have failed. For example, in 1971 the United States imposed price and wage controls, or an income policy, to control inflation. However, these price and wage controls were not very successful and were later repealed. From an efficiency point of view, monetary and fiscal policies and exchange rate changes are to be preferred to direct controls on the domestic economy and on international trade and finance. The reason is that direct controls often *interfere with* the operation of the market mechanism, while the more general expenditure-changing and expenditure-switching policies *work through* the market. Nevertheless, when these general policies take too long to operate, when their effect is uncertain, or when the problem affects only one sector of the economy, nations may turn to direct controls as temporary measures to achieve specific objectives. An example is the "voluntary" export quotas on Japanese automobiles negotiated by the United States in 1981.

In general, for direct controls and other policies to be effective, a great deal of international cooperation is required. For example, the imposition of an import quota by a nation may result in retaliation by the other nations affected (thus nullifying the effect of the quota) unless these nations are consulted and understand and agree to the need for such a temporary measure. The same is true for the exchange rate that a nation seeks to maintain.

CASE STUDY 18-7 Direct Controls on International Transactions Around the World

Table 18.5 summarizes data on the different types of direct controls that various countries imposed on international transactions in 2011. From the table, we see that the most common forms of direct controls on international transactions around the world are capital controls on commercial banks and other credit institutions; guarantees, securities, and financial backup facilities; and capital controls on direct investments, capital market securities, real estate transactions, and institutional investors.

TABLE 18.5. Direct Controls on International Transactions by IMF Members in 2011

Type of Restriction	Number of Countries
A. Exchange rate structure	
1. Dual exchange rates	15
2. Multiple exchange rates	7
B. Arrangements of payments and receipts	
1. Bilateral payments arrangements	68
2. Payment arrears	35
C. Controls on proceeds from exports and/or invisible transactions	
1. Repatriation requirements	87
2. Surrender requirements	57
D. Capital (financial) transactions	
1. Capital (financial) market securities	144
2. Money market instruments	124
3. Collective investment securities	122
4. Derivatives and other instruments	97
5. Commercial credits	85
6. Financial credits	115
7. Guarantees, sureties, and financial backup facilities	79
8. Direct investments	147
9. Liquidation of direct investments	47
10. Real estate transactions	143
11. Personal capital (financial) transactions	95
12. Commercial banks and other credit institutions	168
13. Institutional investors	140

Source: International Monetary Fund, *Exchange Arrangements and Exchange Restrictions* (Washington, D.C.: IMF, 2011).

(One notable exception occurred in the early 1990s when the United States allowed the dollar to greatly depreciate with respect to the Japanese yen, against Japanese wishes, in an effort to reduce the large and persistent U.S. trade deficit with Japan.) Similarly, an increase in the interest rate by a nation to attract more foreign capital may be completely neutralized if other nations increase their interest rates by the same amount so as to leave international interest rate differentials unchanged. A more detailed discussion of the process by which most direct controls were dismantled by developed nations after World War II under the leadership of the IMF and GATT is presented in Chapter 21.

SUMMARY

1. Adjustment policies are needed because the automatic adjustment mechanisms discussed in the previous two chapters have unwanted side effects. The most important economic goals or objectives of nations are internal and external balance. Internal balance refers to full employment with price stability. External balance refers to equilibrium in the balance of payments. To reach these goals, nations have at their disposal expenditure-changing policies (i.e., fiscal and monetary policies) and expenditure-switching policies (devaluation or revaluation). According to the principle of effective market classification, each policy should be paired or used for the objective toward which it is most effective.

2. In the Swan diagram, the positively inclined *EE* curve shows the various combinations of exchange rates and domestic absorption that result in external balance. To the left of *EE* we have external surpluses, and to the right external deficits. The negatively inclined *YY* curve shows the various combinations of exchange rates and domestic absorption that result in internal balance. To the left of *YY* there is unemployment, and to the right inflation. The intersection of the *EE* and *YY* curves defines the four possible combinations of external and internal imbalance and helps us determine the policy mix required to reach internal and external balance simultaneously (given by the point of intersection of the two curves).

3. The goods market is in equilibrium whenever the quantities of goods and services demanded and supplied are equal. The money market is in equilibrium whenever the quantity of money demanded for transactions and speculative purposes is equal to the given supply of money. The balance of payments is in equilibrium whenever a trade deficit is matched by an equal net capital inflow or a trade surplus is matched by an equal net capital outflow. The *IS, LM*, and *BP* curves show the various combinations of interest rates and national income at which the goods market, the money market, and the balance of payments, respectively, are in equilibrium. The *IS* curve is negatively inclined, while the *LM* and *BP* curves are usually positively inclined. The more responsive capital flows are to interest rate changes, the flatter is the *BP* curve. If the three curves intersect at the same point, the three markets are simultaneously in equilibrium at that point.

4. Expansionary fiscal policy shifts the *IS* curve to the right, and tight monetary policy shifts the *LM* curve to the left, but they leave the *BP* curve unchanged as long as the exchange rate is kept fixed. Starting from a condition of domestic unemployment and external balance, the nation can achieve internal and external balance simultaneously by the appropriate expansionary fiscal policy and tight monetary policy without changing the exchange rate. The same general policy mix is required for the nation to achieve internal and external balance starting from a condition of internal unemployment and external deficit, except with high capital mobility, where expansionary fiscal and easy monetary policies are required. With perfect capital mobility and a horizontal *BP* curve, monetary policy is completely ineffective, and the nation can reach internal and external balance with the appropriate fiscal policy alone with fixed exchange rates.

5. With flexible exchange rates, the nation could reach internal and external balance by using only monetary or fiscal policy. Using monetary policy will have a greater effect on interest rates in the nation and thus on its rate of growth. With perfectly elastic international capital flows and flexible exchange rates, monetary policy is effective while fiscal policy is completely ineffective.

6. The *IB* and *EB* curves show the various combinations of fiscal and monetary policies required for the nation to achieve internal and external balance, respectively. They are both positively inclined, but the *EB* curve is flatter, or more effective for achieving external balance, because monetary policy also induces short-term international capital flows. The nation should use fiscal policy to achieve internal balance and monetary policy to achieve external balance. (If the nation does the opposite, it will move farther and farther away from internal and external balance.) This policy mix, however, is relevant only in the short run. In the

long run, external balance may require a change in the exchange rate. The existence of inflation at less than full employment adds price stability as a third objective. Growth may be a fourth objective. Then, four policy instruments are usually required. Since the mid-1980s, the United States has advocated a coordinated effort among the leading industrial nations to achieve these objectives.

7. Direct controls can be subdivided into trade controls, exchange controls, and others. Trade controls refer to tariffs, quotas, advance deposits on imports, and other selective restrictions on the flow of international trade. Exchange controls include restrictions on international capital movements, forward market intervention, and multiple exchange rates. Other direct controls sometimes applied to reduce inflation when more general policies have failed are price and wage controls. In general, direct controls lead to inefficiencies because they frequently interfere with the operation of the market mechanism. For direct controls and other policies to be effective, international cooperation is often essential.

A LOOK AHEAD

Chapter 19 extends the analysis of adjustment policies in open economies to also deal with price changes. This is done within an aggregate demand and aggregate supply framework. We will examine the effect of international transactions on aggregate demand and aggregate supply and show how a nation can achieve full employment, price stability, and equilibrium in the balance of payments under fixed and flexible exchange rates, and in the short run and the long run.

KEY TERMS

BP curve, p. 580
Direct controls, p. 575
Exchange controls, p. 600
Expenditure-changing policies, p. 573
Expenditure-switching policies, p. 575
External balance, p. 573
Internal balance, p. 573
IS curve, p. 578
LM curve, p. 580
Multiple exchange rates, p. 602
Mundell–Fleming model, p. 578
Phillips curve, p. 597
Principle of effective market classification, p. 575
Speculative demand for money, p. 580
Trade controls, p. 600
Transaction demand for money, p. 580

QUESTIONS FOR REVIEW

1. Why do nations need policies to adjust balance-of-payments disequilibria? Which are the most important objectives of nations?

2. What policies can nations utilize to achieve their objectives? How do these policies operate to achieve the intended objectives?

3. What is meant by the principle of effective market classification? Why is it crucial that nations follow this principle?

4. What does the *EE* curve in the Swan diagram show? What does the *YY* curve show? What are the four zones of external and internal imbalance defined by these two curves? What does the point of intersection of the *EE* and *YY* curves show?

5. How does the Swan diagram help us determine the policy mix to reach external and internal equilibrium simultaneously? Under what conditions does a single policy instrument help a nation reach both external and internal balance simultaneously?

6. What does the *IS* curve show? Why is it negatively inclined? What does the *LM* curve show? What is meant by the transaction and speculative demands for money? Why is the *LM* curve usually positively inclined? What does the *BP* curve show? Why is it usually positively inclined? What determines the slope of the *BP* curve? Under what condition are the goods market, the money market, and the nation's balance of payments simultaneously in equilibrium? Is this necessarily the full-employment level of income?

7. What effects do expansionary and contractionary fiscal policies have on the *IS* curve? What effects do easy and tight monetary policies have on the *LM* curve? Do fiscal and monetary policies directly affect the *BP* curve? What would cause the *BP* curve to shift down? to shift up?

8. How can fiscal and monetary policies be used to achieve full employment and external balance under fixed exchange rates and limited international capital mobility? with high international capital mobility?

9. Why is monetary policy completely ineffective with perfect international capital mobility under fixed exchange rates?

10. How can a nation use fiscal and monetary policies to correct unemployment and a balance-of-payments deficit with flexible exchange rates and imperfect capital mobility? with perfect international capital mobility?

11. What does the *IB* curve show? Why is it positively inclined? What does the *EB* curve show? Why is it positively inclined? Why is the *EB* curve usually flatter than the *IB* curve? Why should the nation use fiscal policy to achieve internal balance and monetary policy to achieve external balance? What happens if the nation does the opposite?

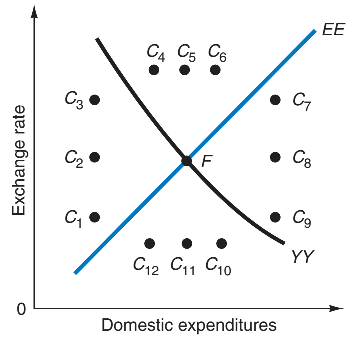
12. What are the criticisms faced by the policy mix of using fiscal policy to achieve internal balance and monetary policy to achieve external balance? What happens when the additional objectives of price stability and growth are recognized as separate goals?

13. What is meant by direct controls? trade controls? exchange controls? Explain how the most important forms of trade and exchange controls operate to affect the nation's balance of payments.

14. What are the advantages and the disadvantages of direct controls? Why do direct controls to affect the nation's balance of payments require international cooperation to be effective?

PROBLEMS

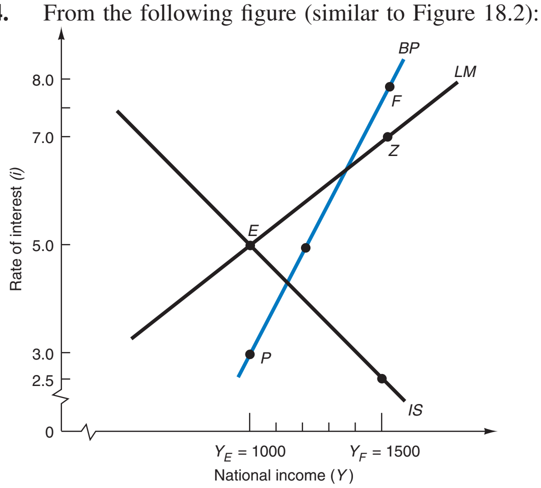
***1.** Indicate the expenditure-changing and expenditure-switching policies required to achieve external and internal balance simultaneously for points C_1, C_4, C_7, and C_{10} in the following figure (similar to Figure 18.1).



2. Indicate the expenditure-changing and expenditure-switching policies required to achieve external and internal balance simultaneously for points C_2, C_5, C_8, and C_{11}, in the figure for Problem 1.

3. Indicate the expenditure-changing and expenditure-switching policies required to achieve external and internal balance simultaneously for points C_3, C_6, C_9, and C_{12}, in the figure for Problem 1.

4. From the following figure (similar to Figure 18.2):



   (a) Indicate whether the nation faces a deficit or surplus in its balance of payments at $Y_E = 1000$.

   (b) Determine the size of the deficit or surplus that the nation faces at $Y_E = 1000$ if its marginal propensity to import is $MPM = 0.15$ and there are no foreign repercussions.

5. Show how the nation in Problem 4 can reach full employment with external balance by using the appropriate mix of fiscal and monetary policies.

6. Draw on graph paper a figure similar to Figure 18.4, but without the broken curves IS' and LM' and assuming that the full-employment level of national income is $Y_F = 1200$. Indicate on your figure the appropriate mix of fiscal and monetary policies required for the nation to achieve simultaneously internal and external balance under a fixed exchange rate system.

7. Repeat Problem 6 for the assumption that the full-employment level of national income is $Y_E =$ 1000.

8. Draw on graph paper a figure similar to Figure 18.2, but interchanging the labels of the *LM* and *BP* curves so that the *BP* curve is now flatter than the *LM* curve.

   (a) Show on your graph the appropriate mix of fiscal and monetary policies required by the nation to reach full employment with external balance.

   (b) How does the required policy mix in this case differ from that required for the case shown in Figure 18.2 discussed in Section 18.4?

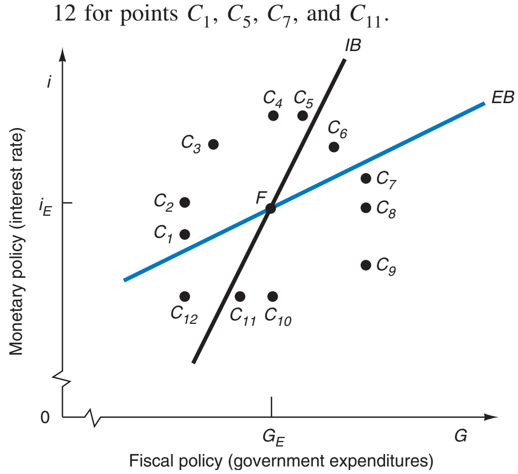
9. Explain what would happen in Problem 8 if international capital flows were perfectly elastic.

10. Starting from point *E* in Figure 18.8, draw a figure showing how the nation could reach internal and external balance with flexible exchange rates by using an expansionary fiscal rather than an easy monetary policy.

*11. Starting from point *E* in Figure 18.8, draw a figure showing how the nation could reach internal and external balance with flexible exchange rates by using an expansionary fiscal rather than an easy monetary policy if capital mobility is large and the *BP* curve is to the right of point *Z* in Figure 18.8.

*12. Indicate the type of fiscal and monetary policies required to reach point *F* in the following figure (similar to Figure 18.10) for points C_3, C_6, C_9, and C_{12}.

13. Indicate the type of fiscal and monetary policies required to reach point *F* in the figure for Problem 12 for points C_1, C_5, C_7, and C_{11}.



14. Indicate the type of fiscal and monetary policies required to reach point *F* in the figure for Problem 12 for points C_4, C_8, and C_{10}.

*= Answer provided at www.wiley.com/college/salvatore.

APPENDIX

In Sections A18.1 to A18.3 of this appendix, we show how the *IS*, *LM*, and *BP* curves of Figure 18.2 are derived, and the effects on these curves of fiscal policy, monetary policy, and a depreciation or devaluation of the nation's currency. Section A18.4 summarizes the analysis mathematically.

A18.1 Derivation of the *IS* Curve

Figure 18.12 consists of four panels labeled I to IV as we move clockwise, which are used to derive the *IS* curve in panel I. The *IS* curve shows the various combinations of interest rates *(i)* and levels of national income *(Y)* at which the goods market is in equilibrium in the sense that the leakage from the income stream, in the form of domestic saving *(S)* plus imports *(M)*, is equal to the injections into the income stream in the form of investment *(I)* plus exports *(X)*, and assuming for the moment the absence of a government sector.

In panel II, the saving plus import function $[S(Y) + M(Y)]$ from the top panel of Figure 17.3 is plotted showing the positive relationship between total leakages and the level of national income. The 45° line in panel III shows the equilibrium condition that leakages $(S + M)$ equal injections $(I + X)$. Panel IV shows total injections in the form of the investment function (where investment is inversely related to the rate of interest) plus the exogenous export function $[I(i) + X]$. The investment function is usually referred to as the marginal efficiency of investment schedule. For example, at $Y_E = 1000$, $S + M = 450 = I + X$ at $i = 5.0\%$, so that we derive point E in panel I. Similarly, at $Y_F = 1500$, $S + M = 650 = I + X$ at $i = 2.5\%$, so that we derive point U in panel I. Assuming that the *IS* curve is a straight line, we can derive the *IS* curve by joining point E and point U in panel I. This is the *IS* curve in Figure 18.2.

The inclusion of government expenditures *(G)* will lead to a total injections function of $I(i)) + X + G$, which is to the left of the total injections function shown in panel IV by the amount of G, and an *IS* function, which is to the right of the one shown in panel I by the amount of G times the open-economy multiplier (k'). On the other hand, the inclusion of taxes *(T)* will lead to a total leakage function of $S(Y) + M(Y) + T$, which is higher than the total leakage function shown in panel II by the amount of T, and *IS* function, which is to the left of the one shown in panel I by the amount of T times the open-economy tax multiplier. The equilibrium condition that total injections equal total leakages is then

$$I + X + G = S + M + T \tag{18A-1}$$

The inclusion of government expenditures (G) and taxes (T) will allow us to use the diagram to analyze the effect of fiscal policy on the *IS* curve. In what follows, however, we assume for simplicity that there are no taxes and that G is for fiscal policy purposes only.

The diagram can also be used to examine the effect of a depreciation or devaluation on the *IS* curve. Specifically, a depreciation or devaluation of the nation's currency will reduce its imports at each level of income, so that the total leakages function in panel II shifts up by the reduction of imports at each level of income. At the same time, the nation's exports will increase, shifting the total injections function in panel IV to the left by the increase in exports. The *IS* function in panel I will then shift to the right by the improvement in the nation's trade balance $(X - M)$ times the nation's open-economy multiplier.

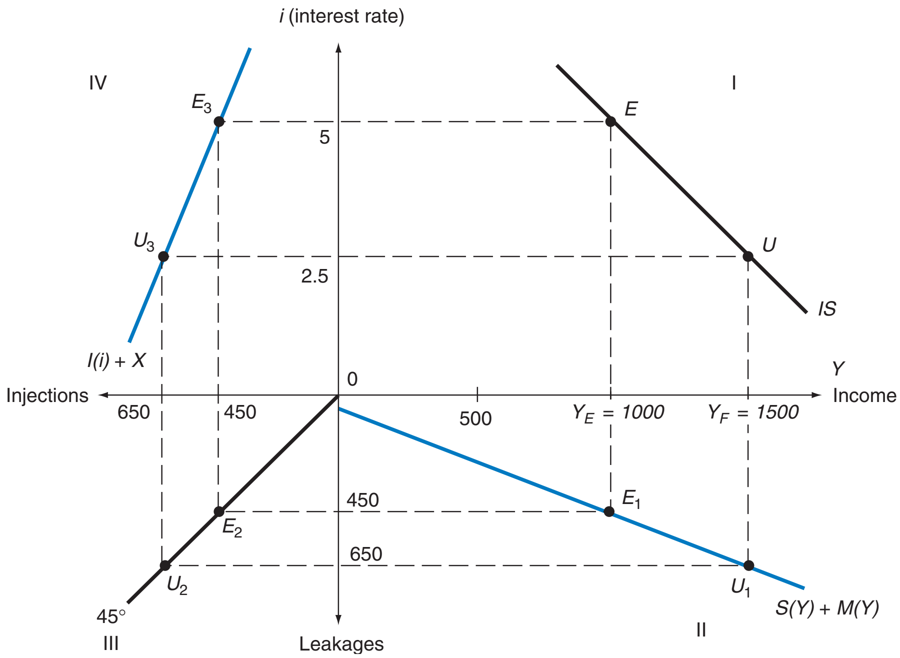


FIGURE 18.12. Derivation of the *IS* Curve.
Panel II shows the positive relationship between the leakages of saving plus imports and national income. The 45° line in panel III shows the equilibrium condition that leakages $(S + M)$ equal injections $(I + X)$. Panel IV shows the total injections function of investment (which is inversely related to the interest rate) and exogenous exports. The *IS* curve in panel I shows the various combinations of i and Y at which the goods market is in equilibrium (given by leakages equal injections). Expansionary fiscal policy shifts the total injections function to the left by the increase in government expenditures (G) and shifts the *IS* curve to the right by the increase in G times the open-economy multiplier (k'). A depreciation or devaluation shifts the total leakages function up by the reduction in M at each Y, shifts the total injections function to the left by the increase in X, and shifts the *IS* function to the right by the increase in $(X - M)$ times k'.

Problem Trace (i.e., pencil in) in each of the four panels of Figure 18.12 the effect of an expansionary fiscal policy that increases government expenditures (G) from 0 to 50. Assume that the government changes the money supply as it pursues this expansionary fiscal policy in such a way as to keep the interest rate unchanged. Assume also that the open-economy multiplier for the nation is $k' = 2.5$ (as in Section 17.3D under the assumption that the nation is small enough that there are no foreign repercussions).

A18.2 Derivation of the *LM* Curve

The four panels of Figure 18.13 are used to derive the *LM* curve in panel I. The *LM* curve shows the various combinations of interest rates (i) and levels of national income (Y) at which the money market is in equilibrium in the sense that the quantity of money demanded for transaction and speculative purposes is equal to the given and fixed supply of money.

Panel II shows the positive relationship between the transaction demand for money (MT) and national income (with MT a constant fraction of Y). Panel III shows how much of

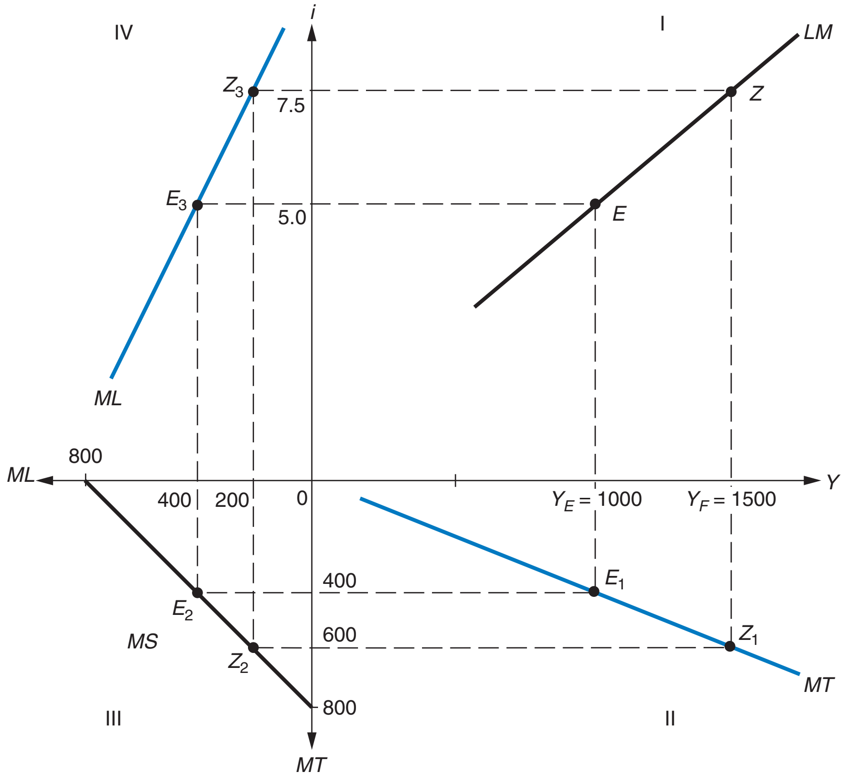


FIGURE 18.13. Derivation of the *LM* Curve.
Panel II shows the positive relationship between the transaction demand for money (*MT*) and national income (*Y*). Panel III shows how much of the assumed total supply of money of $MS = 800$ is held for transaction purposes and how much is left for speculative purposes. Panel IV shows the speculative, or liquidity, demand for money (*ML*) as a decreasing function of the rate of interest. The *LM* curve in panel I shows the various combinations of i and Y at which the money market is in equilibrium (given by the equality of the total demand for money to the fixed supply of money). Easy monetary policy shifts the *MS* curve down in panel III and the *LM* curve to the right in panel I in order to reestablish equilibrium in the money market. A depreciation or devaluation shifts the *MT* curve down in panel II and the *LM* curve to the left in panel I.

the assumed total supply of money of $MS = 800$ is held for transaction purposes and how much is left for speculative purposes. Panel IV shows the speculative, or liquidity, demand for money *(ML)* as a decreasing function of the rate of interest. That is, the higher the rate of interest or the opportunity cost of holding money balances, the smaller is the quantity demanded for speculative, or liquidity, purposes.

For example, at $Y_E = 1000$, $MT = 400$, leaving another 400 (out of $MS = 800$) to be held for liquidity purposes at $i = 5.0\%$. This defines point E in panel I. Similarly, at $Y_F = 1500$, $MT = 600$, leaving 200 of the fixed money supply of $MS = 800$ to be held for liquidity purposes at $i = 7.5\%$. This defines point Z in panel I. Joining points E and Z in panel I, we derive the LM curve (on the assumption that the LM curve is a straight line). This is the LM curve in Figure 18.2.

An increase in the supply of money as a result of easy monetary policy will shift the *MS* curve down in panel III and shift the *LM* curve to the right in panel I until equilibrium in the money market is reestablished. On the other hand, a depreciation or devaluation of the nation's currency will increase domestic prices and the transaction demand for money (i.e., *MT* shifts down in panel II) and shift the *LM* curve to the left in panel I until equilibrium in the money market is reestablished.

Problem Starting from point *E* on the *LM* curve in panel I, trace (i.e., pencil in) in each of the four panels of Figure 18.14 the effect of (a) an easy monetary policy that increases the nation's money supply by 100, on the assumption that the entire increase in the money supply will be held for transaction purposes, and (b) a depreciation that shifts the *MT* function down by 200 in panel II, on the assumption that monetary authorities keep *MS* at 800. (c) What happens if instead monetary authorities increase *MS* by 200 to $MS = 1000$ in part (b)?

A18.3 Derivation of the *BP* Curve

The four panels of Figure 18.14 are used to derive the *BP* curve in panel I. The *BP* curve shows the various combinations of interest rates and national income at which the nation's balance of payments is in equilibrium.

In panel II, the trade balance $(X - M)$ from the bottom panel of Figure 17.3 is plotted as a *decreasing* function of national income. The 45° line in panel III shows the external equilibrium condition that a balance-of-trade deficit be matched by an equal net short-term *capital inflow*, or a balance-of-trade surplus be equal to a net short-term *capital outflow*. Panel IV shows net short-term capital inflows (SC) as an increasing function of the interest rate in the nation (and interest differential in favor of the nation on the assumption of constant interest rates abroad). For example, at $Y_E = 1000$, $X - M = 0 = SC$ at $i = 5.0\%$. This defines point *E* in panel I. Similarly, at $Y_F = 1500$, $X - M = -75$ and $SC = +75$ (so that $X - M + SC = 0$) at $i = 8.0\%$. This defines point *F* in panel I. By joining points *E* and *F*, we derive the *BP* curve in panel I and in Figure 18.2. Note that at $Y < Y_E$, $X - M > 0$ and $SC < 0$ (i.e., there is a net capital outflow from the nation), so that $X - M + SC = 0$ and we get another point on the *FE* curve below point *E*.

The *BP* curve is drawn on the assumption that the exchange rate is fixed. A depreciation or devaluation from a condition of less than full employment in the nation shifts the $X - M$ function up and improves the nation's trade balance at each level of income so that a smaller net short-term capital inflow (or an even greater outflow) is needed at a lower *i* to keep the balance of payments in equilibrium (i.e., the *BP* curve shifts down in panel I).

Problem Starting from point *E* on the *BP* curve in panel I, trace (i.e., pencil in) in each of the four panels of Figure 18.14 the effect of a depreciation or devaluation that shifts the $X - M$ function up by 50 in panel II.

A18.4 Mathematical Summary

The preceding discussion can be summarized mathematically in terms of the following three equations, respectively, the equilibrium condition in the goods market, in the money

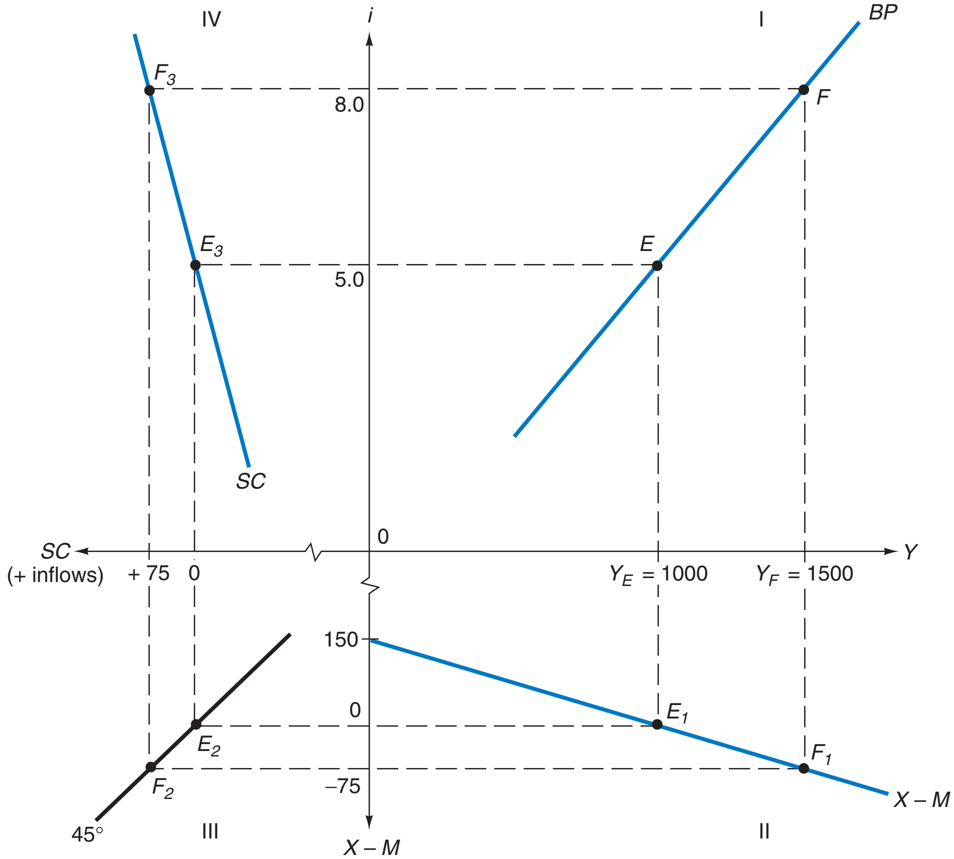


FIGURE 18.14. Derivation of the *BP* Curve.
Panel II shows the negative relationship between the trade balance (*X* – *M*) and national income (from the bottom panel of Figure 17.3). The 45° line in panel III shows the external equilibrium condition that a balance-of-trade deficit be matched by an equal net short-term capital inflow (*SC*). Panel IV shows *SC* as an increasing function of *i*. The *BP* curve shows the various combinations of *i* and *Y* for external balance. A depreciation or devaluation shifts the *X* – *M* function up at each *Y* so that a smaller *SC* at a lower *i* is needed to maintain external balance (i.e., the *FE* curve shifts down).

market, and in the balance of payments, in terms of the three unknowns of the system, which are the level of national income *(Y)*, the rate of interest *(i)*, and the exchange rate *(R)*.

As pointed out in Section A18.1, equilibrium in the goods market for an open economy with a government sector occurs where the sum of the injections of investment *(i)* plus government expenditures (G^*, used as a fiscal policy variable) plus exports *(X)* equals the sum of the leakages of saving *(S)* plus imports *(M)*, and assuming zero taxes *(T)*.

$$\bar{I}(\bar{i}) + G^* + X(\overset{+}{R}) = S(\overset{+}{Y}) + M(\overset{+}{Y}, \overset{-}{R}) \qquad \text{(18A-2)}$$

where the variables in parentheses denote functional dependence and the positive or negative signs above the variables refer to a direct or inverse functional relationship. For example,

$I(\bar{i})$ means that investment is inversely related to or is a decreasing function of the rate of interest.

For the money market to be in equilibrium, the transaction demand for money *(MT)* plus the speculative, or liquidity, demand for money *(ML)* must be equal to the money supply, which is determined by the monetary authorities and is used as a monetary policy variable (MS^*):

$$MT(\overset{+}{Y}, \overset{+}{R}) + ML(\bar{i}) = MS^* \tag{18A-3}$$

Finally, for the balance of payments to be in equilibrium, the balance on net short-term international capital flows *(SC)* must be equal in absolute amount and opposite in sign to the trade balance *(TB)*:

$$SC(\overset{+}{i}) = TB(\overset{-}{Y}, \overset{+}{R}) \tag{18A-4}$$

Given the value of policy variables G^* and MS^*, we can determine the equilibrium value of Y, i, and R. Graphically, this corresponds to a point such as point E in Figure 18.8, where the *IS, LM*, and *BP* curves intersect and the three markets are simultaneously in equilibrium.

Since G^* appears only in Equation (18A-2), fiscal policy affects only the goods market and shifts only the *IS* curve. Since MS^* appears only in Equation (18A-3), monetary policy affects only the money market and shifts the *LM* curve only. Since R appears in all three equations, a change in the exchange rate affects all three markets and shifts all three curves (as indicated in Section 18.5).

Problem Use the above three equations to trace the effects of (a) a contractionary fiscal policy, (b) a tight monetary policy, and (c) an appreciation or revaluation of the nation's currency.

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INTERNet

Data on the current account, budget balance, and growth of the GDP of the United States that can be used to examine the relationship among them are found on the Bureau of Economic Analysis, the Penn World Table, and the Federal Reserve Bank of St. Louis web sites, respectively, at:

http://www.bea.doc.gov

http://research.stlouisfed.org/fred2

Information and data on the conduct and effectiveness of fiscal and monetary policy in industrial nations can be found on the web sites of the Bank for International Settlements (BIS), the Organization for Economic Cooperation and Development (OECD), and the National Bureau of Economic Research (NBER), respectively, at:

http://www.bis.org

http://www.oecd.org

http://www.nber.org

chapter 19

Prices and Output in an Open Economy: Aggregate Demand and Aggregate Supply

LEARNING GOALS:

After reading this chapter, you should be able to:

- Understand how short- and long-run equilibrium is reached under fixed and flexible exchange rates with the aggregate demand and aggregate supply
- Understand how real and monetary shocks, and monetary and fiscal policies, affect the nation's aggregate demand and equilibrium
- Explain how monetary and fiscal policies can be used to adjust to supply shocks and stimulate growth in an open economy

19.1 Introduction

In our discussion of open-economy macroeconomics, we have generally assumed until now (except briefly in Sections 17.6 and 18.6) that prices remain constant as the economy expands and contracts. Only when the economy reaches the full-employment constraint would prices begin to rise. In the real world, however, prices rise and fall as the economy expands and contracts during the regular course of the business cycle. In this chapter, we relax the assumption of constant prices and examine the relationship between price and output in an open economy. We do so by using an aggregate demand and aggregate supply framework that incorporates the effects of international trade and capital flows.

We begin in Section 19.2 by reviewing the concepts of aggregate demand and aggregate supply, and by showing how equilibrium is determined at their intersection in the short run and in the long run in a closed economy. Section 19.3 then expands the presentation to examine the effect of international transactions on aggregate demand and aggregate supply under fixed and flexible exchange rates. Section 19.4 extends the analysis to examine the effect of real and monetary shocks as well as changes in fiscal and monetary variables on the nation's aggregate demand. In Section 19.5, we discuss the effect of monetary and fiscal policies in an open economy under flexible and fixed exchange rates. Finally, Section 19.6

focuses on monetary and fiscal policies to stimulate long-run growth and to adjust to supply shocks in open economies.

19.2 Aggregate Demand, Aggregate Supply, and Equilibrium in a Closed Economy

In this section, we begin by defining the aggregate demand curve and showing how it is derived from the *IS* and *LM* curves of the previous chapter. Then we examine the aggregate supply curve in the long run and in the short run. Finally, we look at how the interaction of the aggregate demand and supply curves determines equilibrium in a closed economy in the short run and in the long run.

19.2A Aggregate Demand in a Closed Economy

The aggregate demand (*AD*) curve shows the relationship between the total quantity demanded of goods and services in an economy and the general price level, while holding constant the nation's supply of money, government expenditures, and taxes. This is analogous to an individual's demand curve for a commodity, except that the *AD* curve refers to the *total* quantity demanded of domestic goods and services in the nation as a function of, or with respect to, the *general* price level or GDP deflator. The aggregate demand curve is downward sloping, indicating that the total quantity of domestic goods and services demanded in the nation is greater the lower the price level.

Figure 19.1 shows how the aggregate demand curve is derived from the *IS*–*LM* model of the previous chapter. Recall from Section 18.3 and Figure 18.2 that the *IS* curve shows the

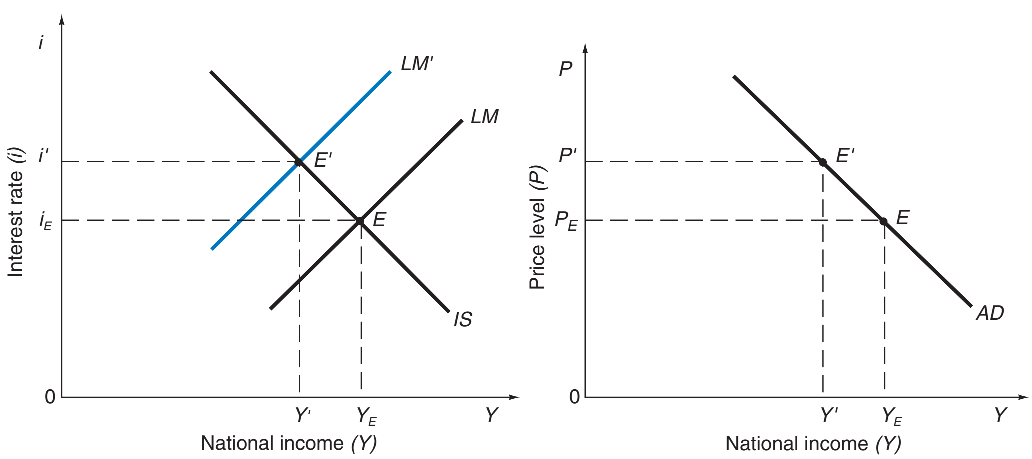

FIGURE 19.1. Derivation of the *AD* Curve from the *IS*–*LM* Curves.
The intersection of the *IS* and *LM* curves at a given price level determines the equilibrium interest rate (i_E) and national income (Y_E) at point *E* in the left panel. This defines point *E* at price P_E and income Y_E on aggregate demand curve *AD* in the right panel. An increase in price from P_E to P' reduces the real value of the nation's given money supply and causes the *LM* curve to shift to the left to *LM*′, thus resulting in the lower income level of Y' at point *E*′ in the left panel and on the *AD* curve in the right panel.

various combinations of interest rates (i) and national income (Y) that result in equilibrium in the goods market (i.e., at which the quantity demanded of goods and services equals the quantity supplied). The *LM* curve, on the other hand, shows the various combinations of i and Y at which the demand for money is equal to the given supply of money, so that the money market is in equilibrium. Both the *IS* and *LM* curves are drawn for a given price level. The equilibrium level of national income (Y_E) and interest rate (i_E) is then determined at the intersection of the *IS* and *LM* curves (point E in the left panel of Figure 19.1). This defines point E on the aggregate demand curve *(AD)* in the right panel of Figure 19.1 at the given price level (P_E) and income level (Y_E). Note that both panels measure national income along the horizontal axis, but the right panel has the price level rather than the interest rate on the vertical axis.

Now suppose that prices in the nation rise from P_E to P'. This reduces the real value of the given money supply and causes the *LM* curve to shift to the left to LM'. The intersection of the *IS* and LM' curves at point E' in the left panel of Figure 19.1 defines the higher equilibrium interest rate of i' and the lower equilibrium level of national income of Y'. Note that the higher price does not directly affect the *IS* curve because equilibrium in the goods sector is measured in real terms. The higher equilibrium price P' and lower income level of Y' define point E' on aggregate demand curve *AD* in the right panel. Thus, higher prices are associated with lower levels of national income and result in an *AD* curve that is inclined downward. The steeper are the *IS* and the *LM* curves, the steeper or less elastic is the *AD* curve.

If prices were held constant and the money supply were changed instead, the entire *AD* curve would shift. For example, an increase in the money supply *for a given price level* (easy or expansionary monetary policy) shifts the *LM* curve to the right and results in a higher level of national income. This can be shown by a shift to the right of the entire *AD* curve to reflect the higher level of national income at the given price level (see Problem 3, with answer at the end of the book). Thus, national income can rise either if prices fall with a given money supply (a movement down an *AD* curve) or if the money supply is increased with constant prices (a rightward shift of the *AD* curve). Similarly, an increase in government expenditures and/or reduction in taxes (expansionary fiscal policy) shifts the *IS* curve to the right, and this also causes the *AD* curve to shift to the right, indicating a higher level of national income at each price level. On the other hand, tight or contractionary monetary and fiscal policies shift the *AD* curve to the left.

19.2B Aggregate Supply in the Long Run and in the Short Run

The aggregate supply (*AS*) curve shows the relationship between the total quantity supplied of goods and services in an economy and the general price level. This relationship depends crucially on the time horizon under consideration. Thus, we have a long-run aggregate supply curve and a short-run aggregate supply curve.

The long-run aggregate supply (*LRAS*) curve does not depend on prices but only on the quantity of labor, capital, natural resources, and technology available to the economy. The quantity of inputs available to an economy determines the natural level of output (Y_N) for the nation in the long run. The more inputs are available to the economy, the larger is its natural level of output and income in the long run. Since the long-run aggregate supply curve does not depend on prices, the *LRAS* curve is vertical at the natural level of output when plotted against prices, as shown in Figure 19.2. Thus, higher prices do not affect

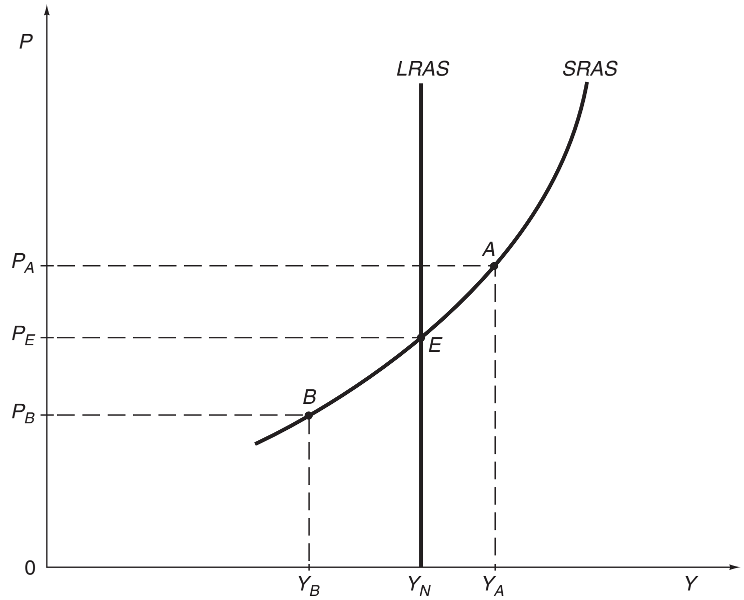

FIGURE 19.2. The Long-Run and Short-Run Aggregate Supply Curves.
The long-run aggregate supply curve *(LRAS)* is independent of prices and is vertical at the nation's natural level of output (Y_N), which depends on the availability of labor, capital, natural resources, and technology in the nation. The nation's short-run aggregate supply curve *(SRAS)* slopes upward, indicating that the nation's output can temporarily exceed (point *A*) or fall short (point *B*) of its natural level (point *E*) because of imperfect information or market imperfections.

output in the long run. The only way to increase output in the long run is for the economy to increase the supply of inputs or resources. Since this occurs only gradually over time, we assume no growth in our analysis, at least for now.

The short-run aggregate supply (*SRAS*) curve, on the other hand, slopes upward, indicating that higher prices lead to larger outputs in the short run (see Figure 19.2). The important question is why does output respond positively to price increases in the short run? And how can output in the short run ever exceed the long-run natural level? The short-run aggregate supply curve is upward sloping (so that the level of output can deviate temporarily from the natural level) because of imperfect information or market imperfections. For example, if firms find that they can sell their products at higher prices but do not realize immediately that input prices have also increased in the same proportion, they will temporarily increase output. As a result, aggregate output increases in the short run, say from point *E* to point *A* along the *SRAS* in Figure 19.2. When firms eventually realize *that their costs of production have also increased proportionately*, they will reduce production back to its original level, and so aggregate output returns to its long-run natural level but at the higher price level.

Thus, imperfect information or market imperfections can lead to short-run output levels in excess of the nation's long-run natural level. This is possible by employing workers on an overtime basis and running factories for longer or multiple shifts. Since it becomes progressively more difficult and expensive to continue increasing output in this manner, however, the short-run aggregate supply curve becomes steeper and steeper and eventually vertical (see Figure 19.2). In the long run, firms realize that all prices (and hence their costs) have also increased proportionately and so they reduce production to the original level, with the result that the output of the nation returns to its lower long-run natural level, but at the higher price level prevailing.

The same can also occur in reverse. That is, if firms find that the prices they receive from the sale of their products have declined but do not immediately realize that the price of all products including their inputs have also fallen in the same proportion (and that their costs of production are also the same), they will cut production, and so the nation's output temporarily falls below its natural level (point *B* in Figure 19.2). In the long run, however, firms recognize their error and will increase output to the original long-run natural level (point *E* in Figure 19.2). The same process can be explained by focusing on market imperfections in labor markets (see Problem 5, with answer at the end of the book).

19.2c Short-Run and Long-Run Equilibrium in a Closed Economy

Given the aggregate demand curve and the short-run and long-run aggregate supply curves, we can examine the short-run and the long-run equilibrium in a closed economy with Figure 19.3. We begin at equilibrium point *E* at the intersection of aggregate demand curve

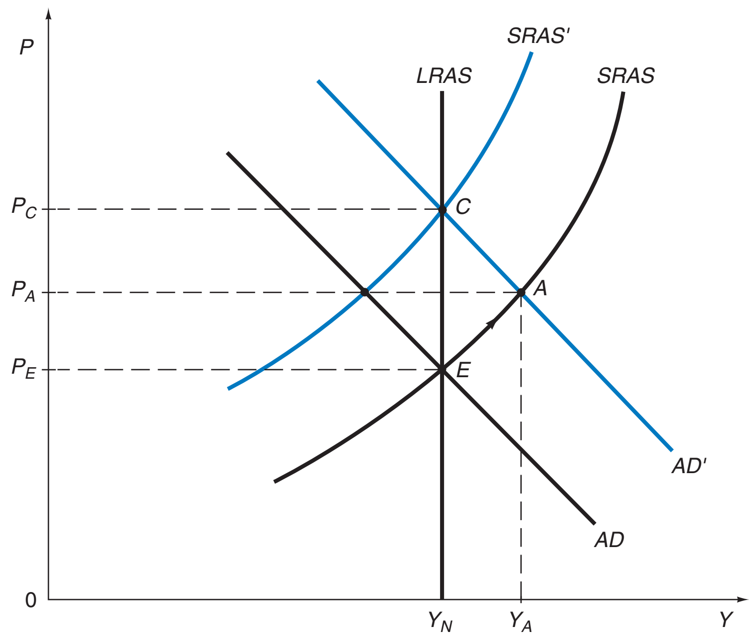

FIGURE 19.3. Equilibrium in a Closed Economy.
At the intersection of the *AD, LRAS*, and *SRAS* curves at point *E*, the nation is simultaneously in long-run and short-run equilibrium. An unexpected increase in *AD* to *AD′* defines the new short-run equilibrium point *A* at the intersection of *AD′* and *SRAS* curves at P_A and Y_A. Y_A exceeds the natural level of output of Y_N. In the long run, as expected prices increase and match actual prices, the *SRAS* curve shifts up to *SRAS′* and defines the new long-run equilibrium point *C* at the intersection of *AD′*, *LRAS*, and *SRAS′* curves at P_C and Y_N.

AD, long-run aggregate supply curve *LRAS*, and short-run aggregate supply curve *SRAS* at the natural level of output Y_N and price level P_E. At point E, the economy is in long-run equilibrium and, therefore, also in short-run equilibrium. Suppose that now there is an unexpected rightward shift in the aggregate demand curve from *AD* to *AD′*. This causes prices to rise, but if firms do not immediately realize that all prices are rising and by mistake believe that only the price of the products they sell are rising, they will increase output. This defines the new short-run equilibrium point *A* at the intersection of the *AD′* and the *SRAS* curves. At point *A*, the price is P_A and the level of output of the nation Y_A, which exceeds the natural level of output of Y_N.

As firms realize that all prices (including their costs of production) have in fact increased, the *SRAS* curve will shift up to *SRAS′*. The intersection of the *AD′* and the *SRAS′* curves on the *LRAS* curve defines the new long-run equilibrium point *C* at the higher price of P_C and natural level of output of Y_N. The price level is now higher but the level of output has returned to its long-run natural level. The short-run increase in output resulting from imperfect information or market imperfection is entirely eliminated in the long run as firms realize that all prices, and hence their costs, have increased proportionately and cut production back to their long-run natural level. That is, in the long run, as expected prices rise to match actual prices, the *SRAS* curve shifts up by the increase in the price level, and the nation's output returns to its lower long-run natural level.

Another way of explaining this is to say that an unexpected increase in aggregate demand leads to an unexpected increase in prices and a temporary increase in output. As expected prices increase in the long run to match the increase in actual prices, the short-run aggregate supply curve shifts up until it crosses the new and higher aggregate demand curve on the given long-run aggregate supply curve, so that the economy is once again simultaneously in long-run and short-run equilibrium at its natural level of output. Thus, a particular *SRAS* curve is based on specific expected prices. When expected prices increase in the long run and match actual prices, the entire *SRAS* curve shifts up by the increase in expected prices. A point to the right of the *LRAS* curve means that actual prices exceed expected prices. Expected prices then increase and this shifts the *SRAS* curve upward until expected prices are equal to actual prices, and the economy returns to its long-run natural level of output equilibrium. Note that the economy is in short-run equilibrium at the intersection of any *AD* and *SRAS* curve. For the economy also to be in long-run equilibrium, the *AD* and *SRAS* curves must intersect on the *LRAS* curve.

In the absence of imperfect information or market imperfection (i.e., if firms did realize immediately that the increase in aggregate demand increased all prices so that price expectations always and immediately matched actual prices), then the nation would move immediately from equilibrium point *E* to equilibrium point *C*, without the intermediate movement to equilibrium point *A* in the short run. In that case, the nation's output would never deviate from its long-run natural level, and the nation's short-run aggregate supply curve would be vertical and coincide with the long-run aggregate supply curve. It is only because of imperfect information and market imperfections that short-run deviations in output from the long-run natural level occur in the real world (see Case Study 19-1). Of course, a downward shift in the aggregate demand curve would result in a temporary reduction in output and a permanent reduction in price (see Problem 6, with answer at the end of the book).

CASE STUDY 19-1 Deviations of Short-Run Outputs from the Natural Level in the United States

Figure 19.4 plots the gross domestic product (GDP) deflator on the horizontal axis (with 1971 = 100) as a measure of price increases and the adjusted growth of real GDP (with 1971 = 100) on the vertical axis for the United States from 1971 to 2011. The adjusted growth of real GDP was obtained by subtracting from the growth of real GDP in the United States in each year the average U.S. long-term real growth of 2.8 percent per year. Thus, the adjusted growth of real GDP provides an estimate of the short-run deviations of growth in real GDP from its long-run natural level (the horizontal line at the level of 100, after removing the 2.8 percent long-term growth trend) in the United States in each year. From the figure, we see that the adjusted or short-run growth in the United States temporarily deviated above and below its long-run natural rate, as predicted by theory, despite increases in the price level (GDP deflator) and other short-run disturbances. Note that Figure 19.4 is similar to Figures 19.2 and 19.3 except that the GDP deflator is plotted along the horizontal axis and the adjusted growth of real GDP is plotted along the vertical axis, rather than vice versa.

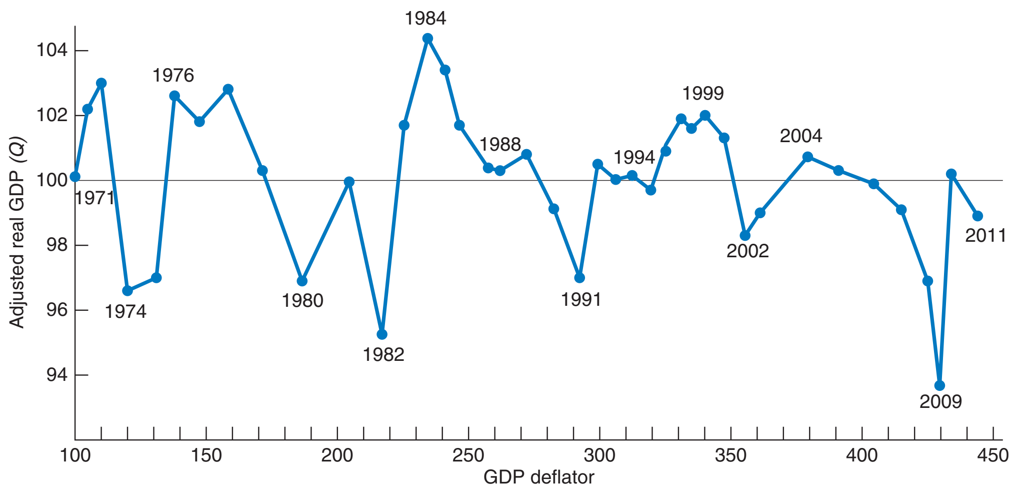

FIGURE 19.4. Short-Run Output Deviations from the Natural Level in the United States.
The adjusted or short-run growth of real GDP in the United States (with 1971 = 100) deviated above and below its natural or long-run level (the horizontal line at the level of 100 after removing the 3 percent long-term growth trend), but only temporarily, as predicted by theory, despite increases in prices (GDP deflator) and other short-run disturbances.
Source: Organization Economic Cooperation and Development, *Economic Outlook* (Paris, various issues).

19.3 Aggregate Demand in an Open Economy under Fixed and Flexible Exchange Rates

Although important long-run supply effects can result, opening the economy affects primarily aggregate demand in the short and medium runs (the time frame for most economic policies). In this section, we examine the aggregate demand effects of opening up the economy, first in the case of fixed exchange rates and then under flexible exchange rates. To reflect the high (though not perfect) international capital mobility among industrial countries today, we will draw the *BP* curve (which refers to the balance of payments) as positively sloped but flatter than the *LM* curve.

19.3A Aggregate Demand in an Open Economy under Fixed Exchange Rates

Figure 19.5 shows the derivation of an open economy's aggregate demand curve under fixed exchange rates and compares it to the aggregate demand curve derived in Figure 19.1 for the closed economy. The left panel of Figure 19.5 shows original equilibrium point *E* in the goods and money markets and in the balance of payments at i_E and Y_E, as in Figure 18.2 (except that now the *BP* curve is flatter than the *LM* curve). This gives point *E* in the right panel of Figure 19.5.

Suppose now that prices in the nation rise from P_E to P'. This reduces the real value of the nation's given money supply and causes the *LM* curve to shift to the left to LM', exactly as in the closed-economy case. With the economy now open, however, there is an additional international effect that must be considered in deriving the nation's aggregate demand curve. That is, the increase in domestic prices from P_E to P' also reduces the nation's exports and increases the nation's imports and causes the *IS* and the *BP* curves also to shift to the left to, say, IS' and BP'. The *IS* curve shifts to the left because of the worsened trade balance. The *BP* curve shifts to the left because higher interest rates are now required at each level of income to attract sufficient additional capital from abroad to compensate for the worsened trade balance that results from the increase in domestic prices.

The intersection of the LM', BP', and IS' curves in the left panel of Figure 19.5 determines new equilibrium point E''. At point E'', the interest rate (i_E) happens to be the same

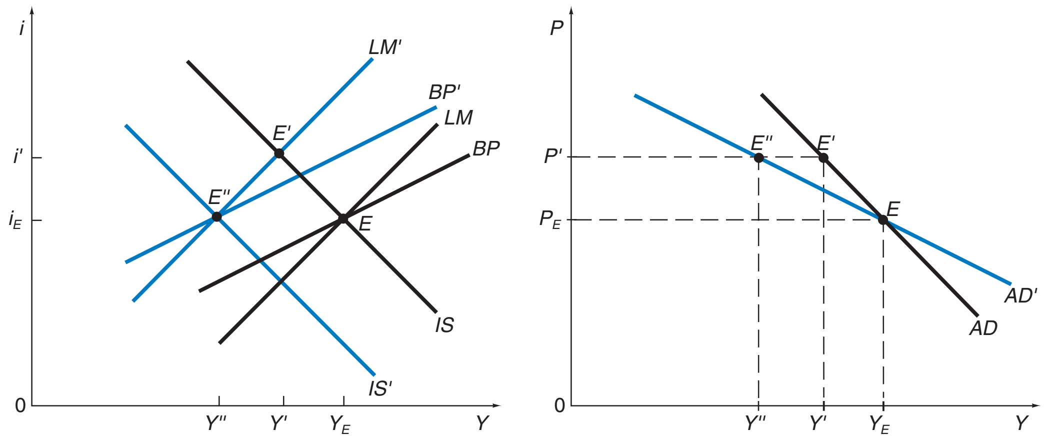

FIGURE 19.5. Derivation of a Nation's Aggregate Demand Curve under Fixed Exchange Rates.
From equilibrium point *E* at the intersection of the *LM, IS*, and *BP* curves at price level P_E and income Y_E in the left panel, we get point *E* in the right panel. An increase in the price level to P' causes the *LM, BP*, and *IS* curves to shift to the left to LM', BP' and IS', thus defining new equilibrium point E'', where these curves intersect. By joining points *E* and E'' in the right panel, we derive open-economy aggregate demand curve AD', which is flatter or more elastic than closed-economy aggregate demand curve *AD*.

as at the original equilibrium point E before the increase in prices in the nation, but prices are higher (P' instead of P_E), and the level of national income is lower (Y'' instead of Y_E). This gives point E'' in the right panel of Figure 19.5. Joining points E and E'' in the right panel gives demand curve AD' for this open economy. Note that AD' is flatter or more elastic than closed-economy aggregate demand curve AD derived earlier because when the economy is open we have the additional effect resulting from international trade and international capital flows that was not present when the economy was closed. Furthermore, the more responsive exports and imports are to the change in domestic prices, the more elastic the AD' curve is in relation to the AD curve (assuming, of course, that the Marshall–Lerner condition is satisfied—see Section 16.4B).

How do we know that the LM' and IS' curves intersect exactly on the BP' curve (as at point E'' in the left panel of Figure 19.5) so that the nation would be once again simultaneously in equilibrium in all three markets? The answer is that if the LM' curve intersected the IS' curve at a point above the BP' curve, the interest rate in the nation would be higher than required for balance-of-payments equilibrium. The nation would then have a surplus in the balance of payments. Under a fixed exchange rate system, the surplus in the nation's balance of payments would result in an inflow of international reserves and thus an increase in the nation's money supply, which would shift the LM' down sufficiently to intersect the IS' curve on the BP' curve, so that the nation would be simultaneously in equilibrium in the goods and money markets and in the balance of payments, as at point E''. The opposite would occur if the LM' and IS' curves crossed below the BP' curve.

19.3B Aggregate Demand in an Open Economy under Flexible Exchange Rates

Figure 19.6 shows the derivation of an open economy's aggregate demand curve under flexible exchange rates and compares it to the aggregate demand curve that we derived in Figure 19.1 for the closed economy and in Figure 19.5 for an open economy under fixed exchange rates. The left panel of Figure 19.6 shows original equilibrium point E in the goods and money markets and in the balance of payments at i_E and Y_E, as in Figure 19.5. This gives point E in the right panel of Figure 19.6.

Now suppose that prices in the nation rise from P_E to P'. This reduces the real value of the nation's given money supply and causes the LM curve to shift to the left to LM'. The increase in domestic prices also reduces the nation's exports and increases the nation's imports and causes the IS and the BP curves to also shift to the left to, say, IS' and BP' exactly as in Figure 19.5. Now, however, the LM' and IS' curves cross at point E'', which is above the BP' curve (point H). This means that the nation has a surplus in its balance of payments. With flexible exchange rates, instead of the nation's money supply increasing and shifting the LM curve to the right (as in the case of fixed exchange rates), the nation's currency appreciates so that the BP' curve shifts to the left again to BP''. This causes a further deterioration in the nation's trade balance and a further shift of the nation's IS' curve to IS'' until the LM' and IS'' curves intersect on the BP'' curve at point E^*, and the nation is once again simultaneously in equilibrium in the goods and services and money markets and in the balance of payments. This gives point E^* in the right panel. Joining points E and E^* in the right panel gives aggregate demand curve AD^*, which is flatter or more elastic than either AD or AD'.

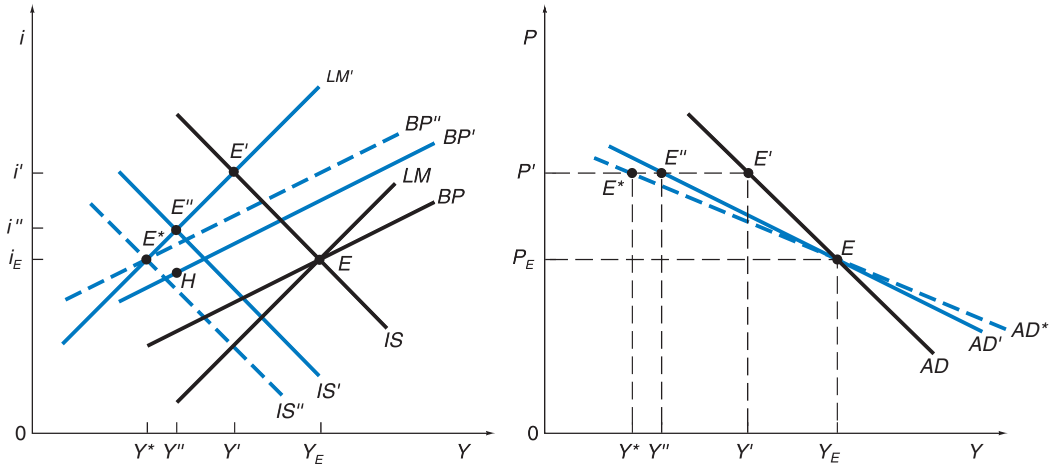

FIGURE 19.6. Derivation of the Nation's Aggregate Demand Curve under Flexible Exchange Rates. Starting from equilibrium point *E* in the left and right panels, an increase in the price level to *P′* causes the *LM, BP*, and *IS* curves to shift to the left to *LM′*, *BP′*, and *IS′*. Since the *LM′* and *IS′* curves intersect above the *BP′* curve (i.e., point *E″* is above point *H*), the nation has a surplus in its balance of payments. The nation's currency then appreciates (i.e., the *BP′* curve shifts to the left to *BP″*). This causes the *IS′* curve to shift further to the left to *IS″* until the *LM′* and the *IS″* curves intersect on the *BP″* curve at point *E**. This gives point *E** in the right panel. Joining points *E* and *E** in the right panel gives aggregate demand curve *AD**, which is more elastic than *AD* and *AD′*.

Note that in the left panel of Figure 19.6, the interest rate at equilibrium point E^* is equal to i_E (the interest rate at the original equilibrium level), but this is only by coincidence. That is, i'' can also be higher or lower than i_E, depending on where the LM', BP'', and IS'' curves intersect. Note that if the LM' and IS'' curves intersected below the BP' curve rather than above it as in the left panel of Figure 19.6 (i.e., if point E^* had been below rather than above point H), then the nation would have a deficit in its balance of payments. In that case, the nation's currency would depreciate (i.e., the BP' curve would shift to the right and so would the IS' curve) until the LM' and IS'' curves intersected on the BP'' curve and the nation was in equilibrium in all three markets. If the LM' and IS' curves intersected on the BP' curve, there would be no change in the nation's exchange rate and no further shift in the BP' and IS' curves, so that the result would be the same as under fixed exchange rates.

19.4 Effect of Economic Shocks and Macroeconomic Policies on Aggregate Demand in Open Economies with Flexible Prices

In the real world, any change that affects the *IS, LM*, or *BP* curves can affect the nation's aggregate demand curve, depending on whether the nation operates under fixed or flexible exchange rates. In this section, we examine the effect of real and monetary shocks as well as fiscal and monetary policies on aggregate demand in open economies with flexible prices under fixed and flexible exchange rates.

19.4A Real-Sector Shocks and Aggregate Demand

Starting from equilibrium point E in both panels of Figure 19.7, suppose that the nation's exports increase or the nation's imports decrease because of an increase in foreign prices or a change in tastes at home or abroad. The increase in the nation's exports or reduction in the nation's imports in the face of constant domestic prices leads to an improvement in the nation's trade balance and causes the nation's IS and BP curves to shift to the right to IS' and BP'. Since the intersection of the IS' and LM curves at point E' is above the BP' curve, the nation would have a surplus in its balance of payments. Under fixed exchange rates, this leads to an inflow of international reserves and an increase in the nation's money supply, which causes a rightward shift in the LM curve to LM', thus defining new equilibrium point E''. The movement from point E to point E'' in the left panel of Figure 19.7 is shown by the shift in the nation's aggregate demand curve from AD to AD'' in the right panel. That is, at the given domestic price of P_E, the nation's output is now Y'' instead of Y because of the autonomous increase in the nation's exports or reduction in the nation's imports.

The result is different if the nation had flexible exchange rates, but we can still utilize Figure 19.7 to analyze this case. With flexible exchange rates, the potential surplus in the nation's balance of payments resulting at point E' in the left panel of Figure 19.7 leads to an appreciation of the nation's currency and a leftward shift of the BP' curve back to its original position of BP (instead of the nation's money supply increasing and causing the LM curve to shift to the right to LM', as in the fixed exchange rate case). The appreciation of the nation's currency (and leftward shift of the BP' curve back to BP) is accompanied by a leftward shift in the IS' curve back to its original IS position (as the trade balance returns to its original level as a result of the appreciation of the nation's currency). Thus, an autonomous improvement in the nation's trade balance has no lasting effect on the nation's

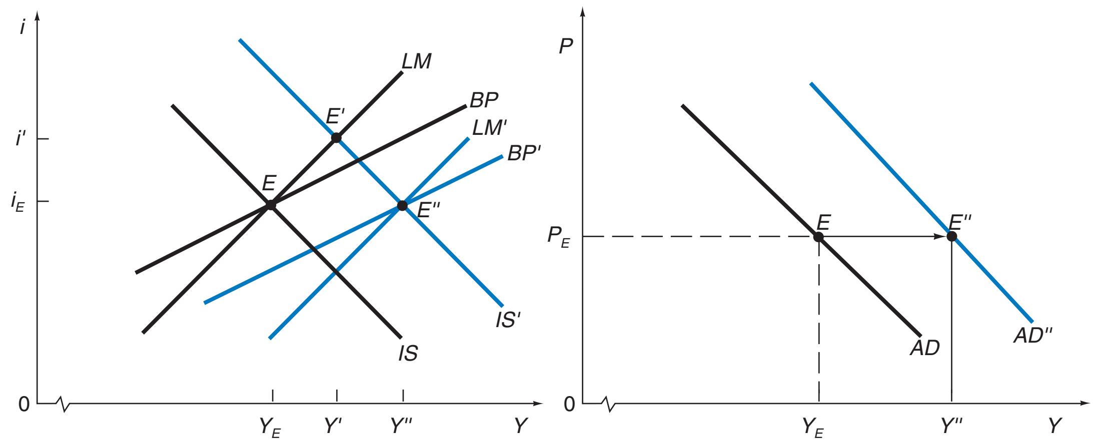

FIGURE 19.7. Changes in the Nation's Trade Balance and Aggregate Demand.
Starting from point E in both panels, an increase in the nation's exports and/or reduction in the nation's imports with unchanged domestic prices causes the IS and BP curves to shift rightward to IS' and BP'. Under fixed exchange rates, this leads to a surplus in the nation's balance of payments and a rightward shift of the LM curve to LM', which defines new equilibrium point E''. Thus, the AD curve shifts rightward to AD''. With flexible exchange rates, the nation's currency appreciates so that the BP' and IS' curves shift back to BP and IS at original equilibrium point E in both panels.

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level of output and aggregate demand (i.e., the nation returns to equilibrium point *E* in the left panel and point *E* on aggregate demand curve *AD* in the right panel) under flexible exchange rates. An autonomous worsening of the nation's trade balance would have the opposite effect.

19.4B Monetary Shocks and Aggregate Demand

Starting from equilibrium point *E* in both panels of Figure 19.8, suppose that there is a short-term capital inflow to or reduced capital outflow from the nation as a result of a reduction in interest rates abroad or a change in tastes at home or abroad. This leads to a rightward shift of the *BP* curve to *BP′* in both panels. With fixed exchange rates, the fact that point *E* is above the *BP′* curve means that the nation has a surplus in its balance of payments (see the left panel of Figure 19.8). This leads to an inflow of international reserves and an increase in the nation's money supply, which cause the nation's *LM* curve to shift to the right to *LM′*, thus defining new equilibrium point *E″* at higher income *Y″*. Since domestic prices are unchanged at the higher level of national income, this means that the nation's aggregate demand curve (not shown in the figure) shifts to the right.

If, on the other hand, the nation operated under flexible exchange rates, the rightward shift in the *BP* curve to *BP′* leads to a potential surplus in the nation's balance of payments (see the right panel of Figure 19.8). This causes the nation's currency to appreciate so that the nation's trade balance worsens. These changes are shown by a leftward shift of the *BP′* and *IS* curves to *BP″* and *IS′* until new equilibrium point *E″* is reached, at which the *LM*, *BP″*, and *IS′* curves intersect at the given price level and lower national income of *Y″*.

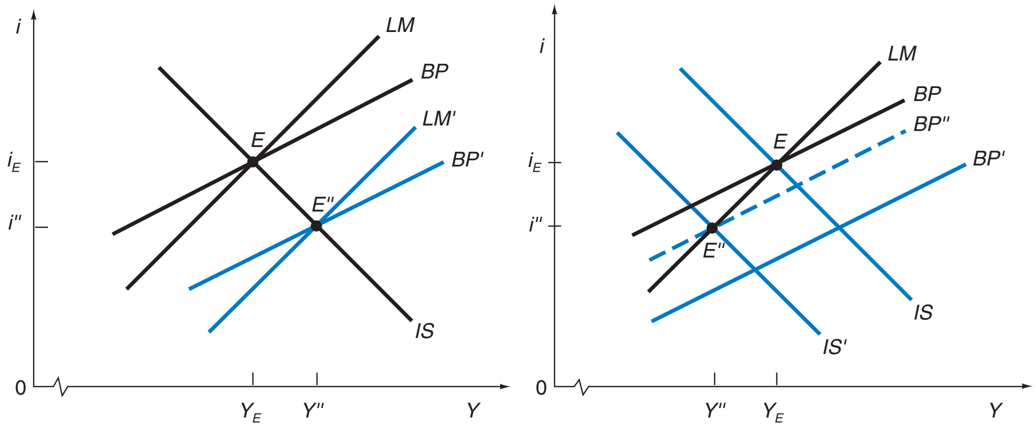

FIGURE 19.8. Short-Term Capital Flows and Aggregate Demand.
Starting from equilibrium point *E* in both panels, an autonomous short-term capital inflow with unchanged domestic prices and fixed exchange rates causes the nation's *BP* and *LM* curves to shift rightward to *BP′* and *LM′*, thus defining new equilibrium point *E″* with higher national income *Y″* in the left panel. Thus, the nation's aggregate demand curve (not shown in the figure) shifts to the right. With flexible exchange rates (the right panel), the nation's currency appreciates, so that the *BP′* and *IS* curves shift to the left to *BP″* and *IS′*, and they define new equilibrium point *E″* along the original *LM* curve, so that the nation's aggregate demand curve shifts to the left.

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As a result, the nation's aggregate demand curve (not shown in the figure) shifts to the left. Thus, a short-term capital inflow leads to a rightward shift of the nation's aggregate demand curve under fixed exchange rates but a leftward shift under flexible rates. The exact opposite occurs with an autonomous short-term capital outflow from the nation.

19.4C Fiscal and Monetary Policies and Aggregate Demand in Open Economies

We have seen in Section 18.4C that under highly elastic short-term international capital flows (i.e., with the *BP* curve flatter than the *LM* curve) fiscal policy is effective while monetary policy is not, whereas the opposite is the case under flexible rates.

Specifically, under fixed exchange rates and highly elastic short-term international capital flows, expansionary fiscal policy will lead to capital inflows and is very effective in shifting the nation's aggregate demand curve to the right. Similarly, contractionary fiscal policy will lead to capital outflows and is very effective in shifting the nation's aggregate demand curve to the left. On the other hand, under fixed exchange rates and high international capital flows, monetary policy is not effective because any attempt by the nation to lower interest rates by increasing the nation's money supply (easy monetary policy) will simply lead to a capital outflow with little if any effect on the nation's aggregate demand.

Under flexible exchange rates and high international short-term capital flows, the opposite is the case. That is, easy monetary policy will be very effective in shifting the nation's aggregate demand curve to the right, and tight monetary policy will be effective in shifting the nation's demand curve to the left. On the other hand, fiscal policy will be ineffective since short-term international capital flows will offset much of the effect of any fiscal policy. Thus, in examining the effect of macroeconomic policies in open economies with flexible prices and highly elastic short-term international capital flows, we will concentrate on fiscal policy under fixed exchange rates and on monetary policy under flexible exchange rates.

We can summarize the effect of economic shocks and macroeconomic policies on aggregate demand under the present conditions of highly elastic short-term international capital flows and flexible prices as follows:

1. Any shock that affects the real sector of the economy affects the nation's aggregate demand (*AD*) curve under fixed exchange rates but not under flexible exchange rates. For example, an autonomous improvement in the nation's trade balance shifts the *AD* curve to the right under fixed exchange rates but not under flexible exchange rates. The reverse is also true.

2. Any monetary shock affects the nation's aggregate demand curve under both fixed and flexible exchange rates—but in opposite directions. For example, an autonomous increase in short-term capital inflows to the nation causes the nation's *AD* curve to shift to the right under fixed exchange rates and to the left under flexible exchange rates. The reverse is also true.

3. Fiscal policy is effective under fixed exchange rates but not under flexible exchange rates. The opposite is true for monetary policy. For example, expansionary fiscal policy—but not monetary policy—can be used to shift the *AD* curve to the right under fixed exchange rates, but monetary policy—not fiscal policy—can be used to shift the nation's *AD* curve to the right under flexible exchange rates.

19.5 Effect of Fiscal and Monetary Policies in Open Economies with Flexible Prices

We have seen in the previous section that under fixed exchange rates and highly elastic short-term international capital flows, fiscal policy is effective whereas monetary policy is ineffective. On the other hand, with flexible exchange rates, monetary policy is effective and fiscal policy is not. Thus, we examine here fiscal policy under fixed exchange rates and monetary policy under flexible rates.

Let us begin by examining the effect of expansionary fiscal policy under fixed exchange rates from initial equilibrium point E, where the AD and $SRAS$ curves cross on the $LRAS$ curve at the nation's natural level of output of Y_N and price level of P_E in the left panel of Figure 19.9 (as in Figure 19.3). An expansionary fiscal policy that shifts the AD curve up to AD' defines new short-run equilibrium point A at the intersection of the AD' and $SRAS$ curves at P_A and Y_A, with Y_A exceeding Y_N. The temporary expansion of output to Y_A occurs because of market imperfections or imperfect information as described in Section 19.3 for a closed economy. That occurs because firms originally believe that only the price of the products they sell has increased and actual prices temporarily exceed expected prices.

Over time, however, as firms realize that all prices (including their costs of production) have increased, the $SRAS$ curve will shift up to $SRAS'$. The intersection of the AD' and the $SRAS'$ curves on the $LRAS$ curve defines new long-run equilibrium point C at the higher price of P_C and natural level of output of Y_N. The price level is now higher, but the level

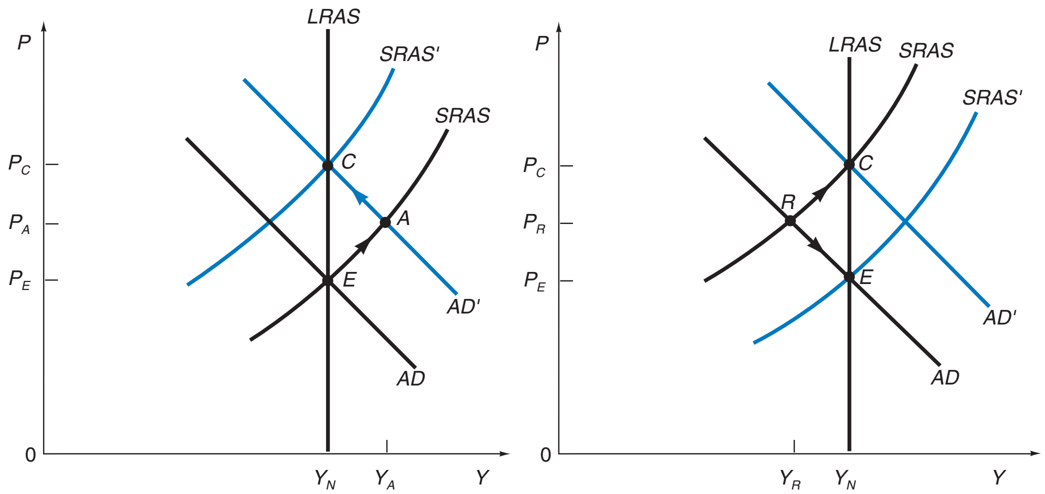

FIGURE 19.9. Expansionary Fiscal Policy from the Natural Level of Output and Recession under Fixed Exchange Rates.
Starting from long-run equilibrium point E in the left panel, expansionary fiscal policy shifts the AD curve up to AD' and defines short-run equilibrium point A at P_A and $Y_A > Y_N$. In the long run, the $SRAS$ curve shifts up to $SRAS'$ defining equilibrium point C at P_C and Y_N. Starting from recession point R in the right panel with P_R and $Y_R < Y_N$, the nation could use expansionary fiscal policy to shift the AD curve up to AD' so as to reach equilibrium point C at P_C and Y_N at the intersection of the AD', $SRAS$, and $LRAS$ curves. The nation, however, could in time have reached equilibrium point E at P_E and Y_N automatically as a result of falling domestic prices because of recession and the $SRAS$ curve shifting down to $SRAS'$.

of output has returned to its lower long-run natural level. The short-run increase in output is entirely eliminated in the long run as expected prices rise to match the increase in actual prices. Note that this is exactly the same as in the closed-economy case. The only difference is that now we are dealing with an open economy. But if we assume, as we do, that the effect of openness in the economy has already been incorporated into the AD and AD' curves, the process by which the nation's output temporarily exceeds but then returns to its long-term natural level at higher prices is exactly the same. More interesting and realistic is the case where the nation uses expansionary fiscal policy from a condition of recession, such as point R at P_R and $Y_R < Y_N$ in the right panel of Figure 19.9. Starting from point R in the right panel, the expansionary fiscal policy that shifts the AD curve to the right at AD' results in new long-run equilibrium point C, where the AD' and $SRAS$ curves intersect on the $LRAS$ curve at higher price level P_C and natural level of output Y_N. Note that the movement for short-run equilibrium point R to long-run equilibrium point C now involves a movement along the $SRAS$ curve.

The nation, however, could have reached equilibrium point E in the long run at the intersection of the AD and $SRAS'$ curves on the $LRAS$ curve without any expansionary fiscal policy by simply allowing market forces to work themselves out. That is, because at point R output level Y_R is below the natural output level of Y_N, all prices, including firms' costs, are expected to fall, and as prices actually fall, the $SRAS$ curve shifts down to $SRAS'$, so as to intersect the unchanged AD curve at point E on the $LRAS$ curve. The nation is now at long-run and short-run equilibrium at the natural level of output of Y_N and lower price level P_E. Note that the movement down the given AD curve from point R to point E reflects not only the closed-economy increase in the aggregate quantity of goods and services demanded as a result of lower domestic prices (as described in Section 19.2A) but also the improvement in the nation's trade balance as a result of lower domestic prices (as described in Section 19.3).

But why then should the nation adopt an expansionary fiscal policy to overcome the recession at point R if this causes inflation, if the recession would be automatically eliminated anyway by lower prices? The reason is that waiting for market forces to overcome the recession might take too long. This is especially likely to be the case if prices are not very flexible downward. Economists who believe that prices are sticky and not very flexible downward favor the use of expansionary fiscal policy. Those who believe that expansionary fiscal policy leads to the expectation of further price increases and inflation prefer that a recession be corrected automatically by market forces without any expansionary fiscal policy.

The effect of monetary policy under flexible exchange rates is qualitatively the same as the effect of fiscal policy under fixed exchange rates (and so we can continue to use Figure 19.9) once we have incorporated into the nation's aggregate demand curve the different adjustment taking place under flexible exchange rates rather than under fixed exchange rates. That is, starting from a position of long-run equilibrium, an easy monetary policy shifts the AD curve to the right, and this leads to a temporary expansion of the nation's output. In the long run, however, as expected prices rise to match the increase in actual prices, the $SRAS$ curve shifts up and defines a new equilibrium point at the natural level of output but higher prices.

With flexible exchange rates, the nation's currency will also have depreciated. Similarly, starting from a position of recession, monetary policy can speed the movement to the higher natural level of output but only at the expense of higher prices. The alternative is for the economy to allow the recession to be corrected automatically by market forces. In that case, the nation would end up with lower prices and an appreciated currency. The problem,

CASE STUDY 19-2 Central Bank Independence and Inflation in Industrial Countries

Figure 19.10 shows the relationship between central bank independence and average inflation in industrial countries from 1955 to 1988. The figure shows that nations with more independent central banks (Germany, Switzerland, and the United States) have had less inflation than nations with less independent central banks (New Zealand, Spain, Italy, the United Kingdom, and France). Specifically, when excessively expansionary fiscal policies push up interest rates and cause an appreciation in the nation's currency, monetary authorities come under increasing pressure from the electorate and fiscal policymakers to counter such effects by expanding the money supply to "accommodate" the increased money demand. If monetary authorities do not resist such pressures (i.e., if the central bank is not sufficiently independent) and comply, the outcome will be inflation. In the United States, the Fed (which operates as the U.S. central bank) is semiautonomous and to a large extent independent of the executive branch, which is in charge of expenditures and taxation (fiscal policy). Thus, the United States has had a better inflation performance than the United Kingdom or France with less independent central banks. In recessionary periods, elected officials and the electorate generally demand easier or more expansionary monetary policy under the threat of reduced central bank independence. A case in point was the 1991–1992 recession in the United States, when the Fed came under strong pressure to ease monetary policy. The Fed needed no prodding and slashed interest rates six times—from 6.5 percent to 1.0 percent—during the 2001 recession.

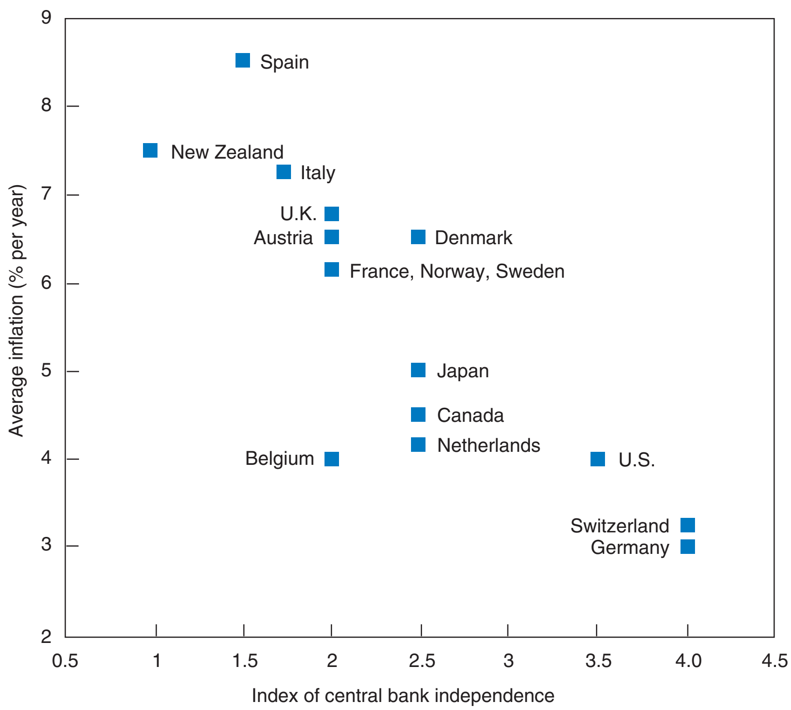

FIGURE 19.10. Index of Central Bank Independence and Average Inflation.
Nations such as Germany, Switzerland, and the United States with more independent central banks have had less inflation than nations such as New Zealand, Spain, Italy, the United Kingdom, and France with less independent central banks.
Source: A. Alesina and L. H. Summers, "Central Bank Independence and Macroeconomic Performance: Some Comparative Evidence," *Journal of Money, Credit and Banking*, May 1993, p. 155.

CASE STUDY 19-3 Inflation Targeting—A New Approach to Monetary Policy

Starting in 1990, some nations adopted inflation targeting as a new approach to monetary policy based on achieving a specific target for inflation. What makes this approach new and different is the explicit public commitment to control inflation with transparency and accountability. By 2012, 26 countries (about half developed and half developing) had adopted the policy (see Table 19.1). Furthermore, the U.S. Federal Reserve, the European Central Bank, the Bank of Japan, and the Swiss National Bank have also adopted many of the main elements of inflation targeting, and others are moving in that direction. In general, inflation-targeting nations seek to achieve the inflation target over the medium term (usually over a two- to three-year horizon) rather than at all times.

Table 19.1 indicates the nations that adopted inflation targeting, the date that they adopted it, the inflation rate at the adoption date, the average inflation rate in 2009, and the target inflation rate (given either as a range or as a rate, plus or minus a specified percentage, usually 1 percent). Although inflation and growth rates improved in most countries over the 1991–2009 period, inflation targeters improved more, experienced less volatility in inflation and growth, and were less adversely affected by global economic crises than other countries.

TABLE 19.1. Inflation Targeters

Country	Inflation targeting adoption date	Inflation rate at adoption date	2009 average inflation rate	Target inflation rate
New Zealand	1990	3.3	0.8	1 – 3
Canada	1991	6.9	0.3	2 +/–1
United Kingdom	1992	4.0	2.2	2 +/–1
Sweden	1993	1.8	–0.3	2 +/–1
Australia	1993	2.0	1.9	2 –3
Czech Republic	1997	6.8	1.0	3 +/–1
Israel	1997	8.1	3.3	2 +/–1
Poland	1998	10.6	3.8	2.5 +/–1
Brazil	1999	3.3	4.9	4.5 +/–2
Chile	1999	3.2	1.5	3 +/–1
Colombia	1999	9.3	4.2	2 – 4
South Africa	2000	2.6	7.1	3 – 6
Thailand	2000	0.8	–0.9	0.5 – 3
Korea	2001	2.9	2.8	3 +/–1
Mexico	2001	9.0	5.3	3 +/–1
Iceland	2001	4.1	12.0	2.5 +/–1.5
Norway	2001	3.6	2.2	2.5 +/–1
Hungary	2001	10.8	4.2	3 +/–1
Peru	2002	–0.1	2.9	2 +/–1
Philippines	2002	4.5	1.6	4.5 +/–1
Guatemala	2005	9.2	1.8	5 +/–1
Indonesia	2005	7.4	4.6	4 – 6
Romania	2005	9.3	5.6	3.5 +/–1
Turkey	2006	7.7	6.3	6.5 +/–1
Serbia	2006	10.8	7.8	4 – 8
Ghana	2007	10.5	19.3	14.5 +/–1

Source: S. Roger, ''Inflation Targeting Turns 20'', *Finance & Development*, March 2010, pp. 47.

however, is that if prices are sticky and not too flexible downward, then the process may take too long. In that case, the cost of inflation from easy monetary policy may be lower than the large opportunity cost of lost output and employment from a protracted recession. There is some evidence that nations with more independent central banks suffer less inflation than nations with central banks that are less independent and more responsive to political pressures (see Case Study 19-2) and so do nations that adopt inflation targeting (see Case Study 19-3).

19.6 Macroeconomic Policies to Stimulate Growth and Adjust to Supply Shocks

In this section, we examine fiscal and monetary policies to stimulate long-run growth and adjust to supply shocks in open economies with flexible prices.

19.6A Macroeconomic Policies for Growth

Although fiscal and monetary policies are used primarily to affect aggregate demand in the short and medium runs, they can also be used to stimulate long-run growth in the economy (i.e., to shift the *LRAS* curve to the right). Governments can stimulate long-run growth by increasing expenditures on education, infrastructures, basic research, and to improve the functioning of markets. Governments can also stimulate long-run growth by tax incentives and low long-term interest rates to encourage private investment. It must be pointed out, however, that the process of long-run growth is not yet entirely understood. To the extent that efforts to stimulate long-run growth in the economy are successful, however, they will shift the nation's *LRAS* curve to the right, leading to more employment, higher incomes, lower prices, and possibly an appreciated currency in the long run.

The use of expansionary macroeconomic (i.e., fiscal and monetary) policies to stimulate growth can be examined with Figure 19.11. We begin at long-run equilibrium point E where the nation's *AD* and *SRAS* curves intersect on the *LRAS* curve at P_E and Y_N. Suppose that now the nation uses expansionary fiscal and/or monetary policies to stimulate long-run growth. The *AD* curve then shifts to the right to, say, AD', so that the nation reaches new short-run equilibrium point A at P_A and $Y_A > Y_N$. (So far, this is the same as in the left panel of Figure 19.9.) To the extent that the expansionary macroeconomic policies do in fact stimulate long-run growth, however, the *LRAS* and *SRAS* curves shift to the right to $LRAS'$ and $SRAS''$ and define new long-run equilibrium point G at P_G $(= P_E)$ and $Y_N' > Y_N$ at the intersection of the $LRAS'$, $SRAS''$, and AD' curves (see Figure 19.11).

Growth has led to a higher level of natural output and no increase in prices in relation to original equilibrium point E. Thus, instead of expansionary macroeconomic policy leading to an upward shift in the *SRAS* curve and the same original level of natural output and much higher prices in the long run in the absence of growth (point C, as in the left panel of Figure 19.9), with growth, the nation reaches a higher level of natural output and no long-run increase in prices. With growth, however, prices could be higher or lower as compared with the original long-run equilibrium level. It all depends on how far to the right the *LRAS* and *SRAS* curves shift in relation to the *AD* curve as a result of expansionary macroeconomic policies aimed at growth. The greater is the rightward shift in the *LRAS* and *SRAS* curves

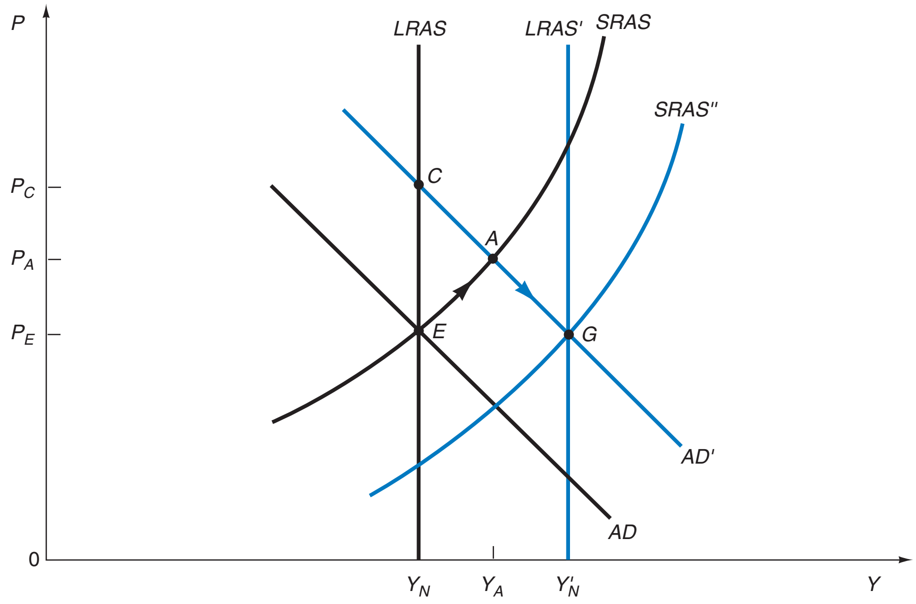

FIGURE 19.11. Macroeconomic Policies for Long-Run Growth.
Starting at original long-run equilibrium point *E*, expansionary macroeconomic policies for growth shift the *AD* curve to the right to *AD*′ and define new short-run equilibrium point *A* at $P_A > P_E$ and $Y_A > Y_N$. With long-run growth, the *LRAS* and *SRAS* curves shift to the right to *LRAS*′ and *SRAS*″ and define equilibrium point *G* at $P_G = P_E$ and $Y'_N > Y_N$.

in relation to the *AD* curve, the greater is the increase in the natural level of output in the nation and the more likely it is that prices will be lower in the long run.

19.6B Macroeconomic Policies to Adjust to Supply Shocks

Macroeconomic policies can also be used to adjust to supply shocks. The most notorious of the postwar supply shocks was the sharp increase in petroleum prices engineered by OPEC (Organization of Petroleum Exporting Countries) between the autumn of 1973 and the end of 1974, and again from 1979 to 1981. The increase in petroleum prices increased production costs in all petroleum-importing countries and caused a leftward shift in their short-run and long-run supply curves. The effect on aggregate demand was less clear. At first sight, it might seem that petroleum-importing nations would suffer a deterioration of their balance of payments, a depreciation of their currencies, and thus a shift to the right in their aggregate demand curves. On closer reflection, however, we find that this need not be the case. The reason follows.

It is true that, because the demand for petroleum is inelastic, an increase in price led to higher total expenditures in all nonpetroleum-producing countries to purchase this crucial input. But the reduction in the natural level of output that accompanied the petroleum shock also induced a reduction in all other imports. Thus, the trade balance of petroleum-importing nations could worsen or improve, depending on which of these two opposing forces was stronger. But there is more. The *BP* curve refers to the balance of payments as a whole, which includes both the trade balance and the balance on capital account. Thus, even if importing nations' trade balances deteriorated as the direct result of the increase in petroleum prices, their capital account could also improve if OPEC nations invested their higher petroleum earnings in industrial nations. This is in fact exactly what happened with the United States. Thus, it is impossible to determine a priori the net effect on importing nations' balance of payments resulting from the increases in petroleum prices. And if we look at the data, we find that the balance of payments improved in some nations and in some years and worsened in others after the two oil shocks; therefore, no general conclusion can be reached. In what follows, therefore, we assume that the aggregate demand curve of petroleum-importing nations remains unchanged as a result of the increase in petroleum prices. It would be a simple matter, however, to examine the situation where this is not the case, and that is left as an exercise.

With the above in mind, we can proceed to use our aggregate demand and aggregate supply framework to analyze the effect of a petroleum shock on industrial nations and the possible macroeconomic policies required to adjust to these shocks. This is done in Figure 19.12. We start at original long-run equilibrium point E with P_E and Y_N at the intersection of the *LRAS, SRAS*, and *AD* curves. The immediate effect of a large increase

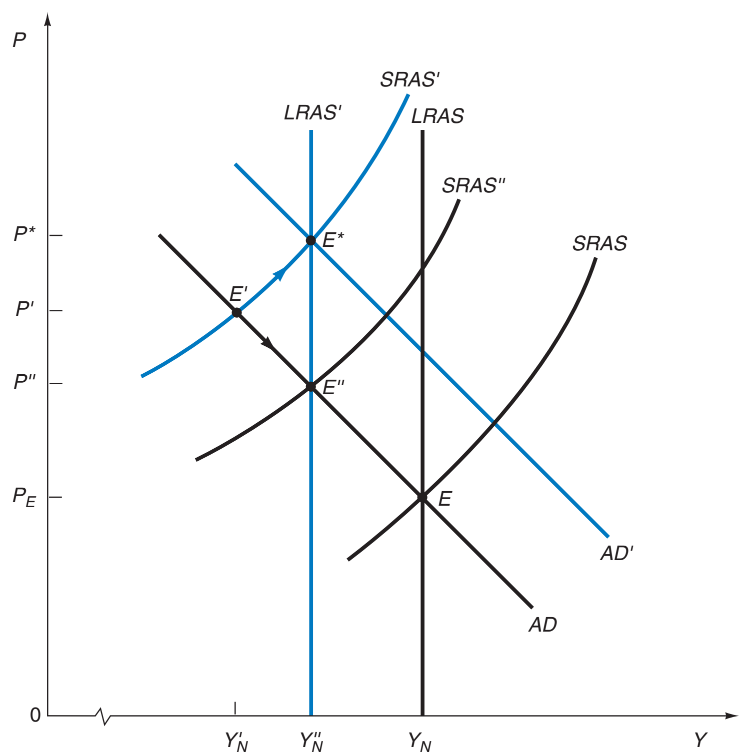

FIGURE 19.12. Macroeconomic Policies to Adjust to Supply Shocks.
From original long-run equilibrium point E, the increase in petroleum prices causes the *SRAS* curve to shift up to *SRAS'*, thus defining short-run equilibrium point E' at $P' > P_E$ and $Y'_N < Y_N$. Over time, prices fall because of recession, and the nation reaches new long-run equilibrium point E'' at the intersection of the *LRAS'*, *SRAS''*, and *AD* curves at $P'' < P'$ and $Y''_N > Y'_N$. An expansionary monetary policy that shifts the *AD* curve to the right to *AD'* would lead to alternative long-run equilibrium point E^* with $P^* > P'$ and Y''_N.

CASE STUDY 19-4 Petroleum Shocks and Stagflation in the United States

Figure 19.13 shows the inflation rate and the rate of unemployment in the United States from 1970 to 2011. The periods of stagflation (shaded in the figure), from the end of 1973 to the middle of 1975 and from the middle of 1979 to the end of 1982 with high inflation and high unemployment, are clearly associated with the two petroleum shocks. Since 1990, the rate of inflation in the United States has closely mirrored the price of petroleum, falling and rising together, while the rate of unemployment continued to fall from 1992 to 2000. The rate of unemployment then rose from 2000 to 2003, fell from 2003 to 2006, rose from 2007 to 2010 as a result of recession, and remained high in 2011 because of the slow recovery. The rate of unemployment remained relatively low up to 2007 and the rate of inflation until 2011, however, despite high petroleum prices.

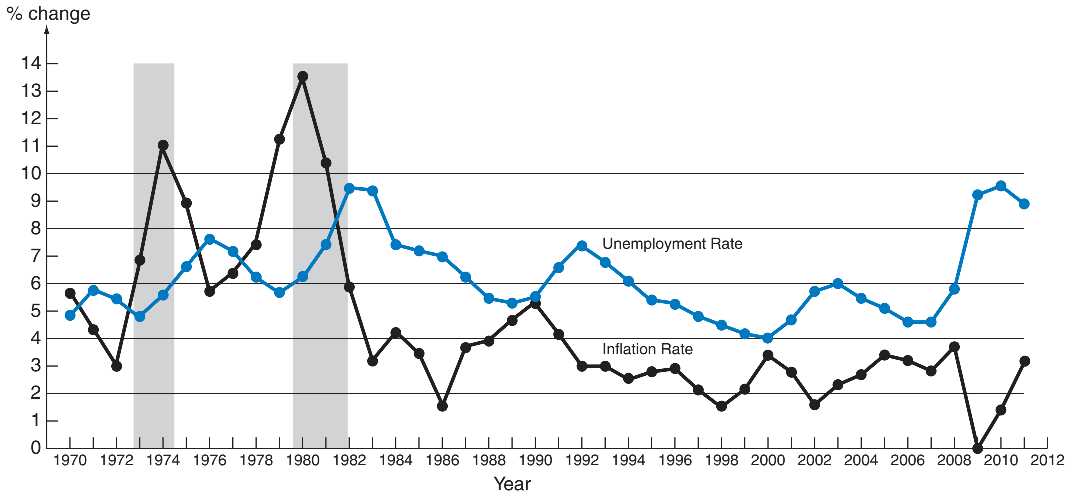

FIGURE 19.13. Stagflation in the United States, 1970–2011.
The shaded areas are periods of stagflation (recession and inflation) in the United States resulting from the two petroleum shocks.
Source: Organization Economic Cooperation and Development, *Economic Outlook* (Paris, various issues).

in petroleum prices is to shift the nation's short-run aggregate supply curve from $SRAS$ to, say, $SRAS'$, thus defining at the intersection of the $SRAS'$ and AD curves the new short-run equilibrium point E' with $P' > P_E$ and $Y'_N < Y_N$. The combination of recession or stagnation and higher prices or inflation at point E' is referred to as stagflation.

The lower level of natural output and employment at Y'_N, however, causes prices to fall, thus lowering costs and shifting the $SRAS'$ curve down and to the right, but not all the way back to $SRAS$. The reason is that long-run production costs have also increased as a result of the increase in petroleum prices, and so the $LRAS$ curve has also shifted to the left, say, to $LRAS'$. Thus, the new long-run equilibrium point E'' is obtained at the intersection of the $LRAS'$, $SRAS''$, and AD curves at $P'' < P'$ and $Y''_N > Y'_N$. At point E'', prices are higher and the natural level of output and employment is lower than at point E before the petroleum shock.

If, instead of waiting for prices to fall and eventually reach long-run equilibrium point E'', the nation used easy or expansionary monetary policy to shift the aggregate demand curve from AD to AD' in order to speed up recovery from point E', the nation would move to equilibrium point E^* at the intersection of the $LRAS'$, $SRAS'$, and AD' curves, and prices would be even higher. Note that in either case the nation would not get back to the natural output level of Y_N that prevailed before the supply (petroleum) shock. Nations such as Italy and France that tried to use expansionary monetary policies to fight the stagflation that resulted from the petroleum shock of the 1970s ended up with much higher inflation rates than nations such as Germany and Japan that used *tight or contractionary* monetary policies to fight inflation, even in the face of recession. Case Study 19-4 clearly shows the two periods of stagflation (recession and inflation) in the United States that resulted from the two petroleum shocks. Case Study 19-5 shows the estimated impact of a \$15 increase in the price of petroleum on the United States, Japan, the Euro Area, and all OECD countries. Case Study 19-6 extends the analysis to the relationship between the actual and the natural unemployment rates, on the one hand, and the rate of inflation, on the other, in the United States since 1980.

CASE STUDY 19-5 Impact of an Increase in the Price of Petroleum

Table 19.2 shows the estimated impact of a sustained or permanent \$15 increase in the price of petroleum in the United States, the European Union (EMU), Japan, and in the OECD as whole in 2004 and 2005. The effects are measured as deviations from the baseline scenario and assuming constant interest rates. The table shows that a \$15 sustained increase in the price of petroleum reduces the level of U.S. GDP by 0.15 percent (about one-seventh of 1 percent) in 2004 and by 0.35 percent in 2005 from what would have been the case without the increase in the price of petroleum. U.S. inflation would be higher by 0.70 percentage points in 2004 and 0.45 percentage points in 2005, while the U.S. current account deficit as a percentage of GDP would worsen by 0.30 percent in 2004 and 0.25 percent in 2005. The table shows that the impact on the EMU, Japan, and OECD is similar. Since the energy crises of the early 1970s and 1980s, industrial nations have become much more energy efficient and now require only half *as much* energy to produce each dollar of GDP than they did in the 1970s. This, together with the process of rapid globalization that has been taking place during the past three decades, has dampened the inflationary impact of increases in the price of petroleum.

TABLE 19.2. Estimated Impact of a \$15 Increase in the Price of Petroleum on U.S., EMU, Japan, and OECD

	U.S.		EMU		Japan		OECD	
	2004	2005	2004	2005	2004	2005	2004	2005
GDP level	−0.15	−0.35	−0.20	−0.20	−0.35	−0.35	−0.20	−0.25
Inflation (percentage points)	0.70	0.45	0.65	0.30	0.40	0.15	0.65	0.35
Current account (% of GDP)	−0.30	−0.25	−0.40	−0.30	−0.30	−0.40	−0.15	−0.15

Source: Organization for Economic Cooperation and Development, *Economic Outlook* (Paris: December 2004), p. 135.

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CASE STUDY 19-6 Actual and Natural Unemployment Rates and Inflation in the United States

Table 19.3 gives the actual unemployment rate and the inflation rate in the United States from 1980 to 2011. Until the mid-1990s, the natural unemployment rate was believed to be about 6 percent in the United States. Any rate of unemployment below 6 percent was supposed to trigger higher inflation. From the table we see that a higher unemployment rate was associated with a lower inflation rate in six of the 14 years from 1980 to 1993 (1982, 1987–1989, 1991–1992). From 1995 to 2007, however, the rate of unemployment fell below the natural level in the United States (except in 2003), but inflation remained very low and even declined in 1997–1998, 2001–2002, and 2006–2007. One explanation that has been given for this phenomenon is that because of the rapid globalization of the world economy, firms try to avoid increasing prices for fear of losing markets to foreign competitors, and workers refrain from demanding excessive wage increases for fear of losing their jobs. In other words, there seems to have occurred a structural change in the U.S. labor market that lowered the natural rate of unemployment from 6 percent in the 1980s to around 4 percent afterward.

Sources: "A Century of Booms and How They Ended," *The Wall Street Journal*, February 1, 2000, p. B1; "Sluggish U.S. Economy a Global Concern," *The New York Times*, September 27, 2002, p. 14; "On the Roll," *U.S. News and World Report*, January 12, 2004, pp. 32–39; C. Reinhart and K. Rogoff, "Is the 2007 U.S. Sub-Prime Financial Crisis So Different? An International Historical Comparison," *American Economic Review*, May 2008, pp. 339–344; and D. Salvatore, "The Global Financial Crisis: Predictions Causes, Effects, Policies, Reforms and Prospects," *Journal of Economic Asymmetries*, December 2010, pp. 1–20.

TABLE 19.3. Unemployment and Inflation Rates in the United States

Year	Unemployment Rate	Inflation Rate	Year	Unemployment Rate	Inflation Rate
1980	7.2	9.2	1996	5.4	2.9
1981	7.6	9.2	1997	4.9	2.3
1982	9.7	6.3	1998	4.5	1.5
1983	9.6	4.3	1999	4.2	2.2
1984	7.5	4.0	2000	4.0	3.4
1985	7.2	3.5	2001	4.8	2.8
1986	7.0	1.9	2002	5.8	1.6
1987	6.2	3.6	2003	6.0	2.3
1988	5.5	4.1	2004	5.5	2.7
1989	5.3	4.8	2005	5.1	3.4
1990	5.6	5.4	2006	4.6	3.2
1991	6.8	4.2	2007	4.6	2.9
1992	7.5	3.0	2008	5.8	3.8
1993	6.9	3.0	2009	9.3	−0.3
1994	6.1	2.6	2010	9.6	1.6
1995	5.6	2.8	2011	8.9	3.1

Source: Organization for Economic Cooperation and Development, *Economic Outlook* (Paris: OECD, May 2012).

SUMMARY

1. In our discussion of open-economy macroeconomics, we have generally assumed until now that prices remained constant as the economy expanded and contracted over the business cycle. In this chapter, we relax the assumption of constant prices and examine the short-run and long-run relationship between price and output in an open economy using an aggregate demand and aggregate supply framework that incorporates the effects of international trade and capital flows.

2. The aggregate demand (*AD*) curve is derived from the *IS–LM* curves of Chapter 18. The *AD* curve slopes downward, indicating that larger quantities of goods and services are demanded in the economy at lower prices. The long-run aggregate supply (*LRAS*) curve is independent of prices and is vertical at the nation's natural level of output, which depends on the availability of labor, capital, natural resources, and technology in the nation. The nation's output can temporarily deviate from its natural level (i.e., the nation's short-run aggregate supply (*SRAS*) curve is upward sloping) because of imperfect information or market imperfections. An unexpected increase in aggregate demand leads firms to temporarily increase their output. In the long run, however, as expected prices increase to match the increase in actual prices, the short-run aggregate supply curve shifts up by the amount of the price increase and defines a new long-run equilibrium point at the natural level of output but higher price level.

3. An increase of the price level in the nation causes a leftward shift in the *LM* curve because of the reduction in the real value of the nation's money supply. The *IS* curve shifts to the left because of the worsened trade balance, and the *BP* curve does the same because higher interest rates are now required to attract more international capital to compensate for the worsened trade balance. An increase in domestic prices thus reduces the aggregate quantity of goods and services demanded in the economy by more than if the economy were closed. The open-economy aggregate demand curve is even flatter or more elastic under flexible exchange rates because an increase in prices and worsened trade balance in the nation usually also lead to exchange rate changes and further trade balance effects.

4. Any change that affects the *IS, LM*, and *BP* curves can affect the nation's aggregate demand curve, depending on whether the nation operates under fixed or flexible exchange rates. An improvement in the nation's trade balance with constant domestic prices leads to a rightward shift in the nation's aggregate demand curve under fixed exchange rates but only to an appreciation of the nation's currency under flexible rates. An autonomous short-term capital inflow to or reduced outflow from the nation results in a rightward shift in the nation's aggregate demand curve under fixed exchange rates but to a leftward shift under flexible rates. Under highly elastic short-term international capital flows, fiscal policy is effective under fixed exchange rates, whereas monetary policy is ineffective. The opposite is true under flexible rates.

5. Expansionary fiscal policy under fixed exchange rates or monetary policy under flexible rates from a position of long-run equilibrium leads to an increase in prices but to only a temporary expansion in output. A nation could correct a recession with expansionary fiscal policy under fixed exchange rates and easy monetary policy under flexible rates but only at the expense of higher prices. In time, the recession would be automatically eliminated by falling prices, but this may take too long if prices are sticky and not too flexible downward. Nations with more independent central banks have had a better inflation performance than nations with less independent central banks.

6. Macroeconomic policies can also be used to achieve long-run growth. The *LRAS* and *SRAS* curves then shift to the right, reaching a larger level of natural output and employment and lower prices than with expansionary macroeconomic policies and no growth. The large supply shocks due to the sharp increases in petroleum prices during the 1970s caused the *SRAS* and *LRAS* curves of petroleum-importing countries to shift to the left because of increased production costs. It is less clear what happened to aggregate demand. The leftward shift in *SRAS* and *LRAS* curves led to recession and inflation (stagflation) in petroleum-importing countries. Nations that used expansionary monetary policies to fight stagflation generally faced even more inflation than nations that did not.

A LOOK AHEAD

The next chapter examines and compares the advantages and disadvantages of flexible versus fixed exchange rate systems with the objective of determining which type of system is "better." The evaluation will be conducted in terms of the degree of uncertainty arising under each system, the type of speculation that each system is likely to give rise to, the likely effect of each system on the rate of inflation, and the policy implications of each system. The conclusion will be reached that each system has some advantages and disadvantages and each may be more appropriate under different sets of circumstances. Chapter 20 also examines the European Monetary System (EMS) and macroeconomic policy coordination. Chapter 21 then deals with the operation of the entire international monetary system.

KEY TERMS

Aggregate demand (*AD*) curve, p. 618
Aggregate supply (*AS*) curve, p. 619
Expected prices, p. 622
Inflation targeting, p. 633
Long-run aggregate supply (*LRAS*) curve, p. 619
Natural level of output (Y_N), p. 619
Short-run aggregate supply (*SRAS*) curve, p. 620
Stagflation, p. 637

QUESTIONS FOR REVIEW

1. Why is it important to examine the relationship between prices and output in our analysis of open-economy macroeconomics? How are prices incorporated into the analysis of open-economy macroeconomics?
2. What does the aggregate demand curve in a closed economy show? How is it derived? Why is it downward sloping?
3. Why is a reduction in the general price level for a given money supply shown as a movement down a given aggregate demand curve, while an increase in the money supply for a given price level is shown as a shift in the aggregate demand curve?
4. How does an increase in government expenditures affect the *AD* curve? Why? To what kind of fiscal policy does this refer?
5. What does the aggregate supply curve show? How does the long-run aggregate supply curve differ from the short-run aggregate supply curve?
6. What is the natural level of output?
7. How can a nation's output temporarily deviate from its natural level? Why and how does a nation's output return to its long-run natural level?
8. Using an aggregate demand and an aggregate supply framework, explain why a nation must necessarily be in short-run equilibrium if it is in long-run equilibrium. How can the nation be in short-run equilibrium without being in long-run equilibrium?
9. How is an open economy's aggregate demand curve derived under fixed exchange rates? Why is this more elastic than if the nation were a closed economy?
10. Why must the Marshall–Lerner condition be satisfied for an open economy's aggregate demand curve to be more elastic than if the economy were closed?
11. How is an open economy's aggregate demand curve derived under flexible exchange rates? Why is this more elastic than if the nation were a closed economy or for an open economy with fixed exchange rates?
12. How does the effect of a real-sector shock on the nation's aggregate demand differ under fixed and flexible exchange rates?
13. How does the effect of a monetary shock on the nation's aggregate demand differ under fixed and flexible exchange rates from the case of a real-sector shock?
14. Why is fiscal policy effective but monetary policy ineffective under fixed exchange rates? Why is the opposite true under flexible rates?

PROBLEMS

1. Using an *IS–LM* diagram, show graphically how a reduction in the general price level in a nation results in a movement down the aggregate demand curve.

2. Using an *IS–LM* diagram, show graphically that for a given *LM* curve, the flatter is the *IS* curve, the flatter or more elastic is the aggregate demand curve.

3. Using an *IS–LM* diagram, show the effect of an easy monetary policy on the aggregate demand curve.

4. Using an *IS–LM* diagram, show the effect of an expansionary fiscal policy on the aggregate demand curve.

***5.** Explain why an unexpected increase in prices in the face of sticky wages (i.e., wages that do not immediately increase in the same proportion as prices) can explain an upward sloping short-run aggregate supply curve.

***6.** Suppose that the original long-run and short-run equilibrium in the economy of Figure 19.3 were at point *C* where the *AD′* curve crosses the *LRAS* and *SRAS′* curves. Explain why a downward shift in the aggregate demand curve from *AD′* to *AD* would result in a temporary reduction in output and a permanent reduction in price.

7. Explain in terms of labor market imperfections how a downward shift in the aggregate demand curve would result in a temporary reduction in output and a permanent reduction in price.

8. Explain how equilibrium in the goods and money markets and in the balance of payments would be reached if the *LM′* curve in the left panel of Figure 19.5 intersected the *IS′* curve below the *BP′* curve for an economy operating under fixed exchange rates.

9. Draw a figure similar to the left panel of Figure 19.6 showing how equilibrium in the goods and money markets and in the balance of payments would be reached if the *LM′* curve intersected the *IS′* curve below the *BP′* curve for an economy operating under flexible exchange rates.

10. Examine the effect on the nation's aggregate demand curve of an autonomous worsening of a nation's trade balance under fixed exchange rates.

11. Do the same as for Problem 10 for flexible exchange rates.

***12.** Explain why the usefulness of expansionary fiscal policy or easy monetary policy to correct a recession depends on how flexible domestic prices are downward.

13. With reference to Figure 19.12, determine what would happen if the monetary policy that shifts the nation's aggregate demand curve to the right to *AD′* in order to adjust to stagflation also leads to growth that keeps the nation's long-run aggregate supply curve at *LRAS* in the long run.

14. Is the concept of the natural rate of unemployment useful in view of the data presented in Case Study 19-5?

*= Answer provided at www.wiley.com/college/salvatore.

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http://www.bis.org

http://www.oecd.org

http://www.nber.org

Information on the specific monetary policies conducted by the world's most important central banks is found at:

http://www.federalreserve.gov/policy.htm

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chapter 20

Flexible versus Fixed Exchange Rates, the European Monetary System, and Macroeconomic Policy Coordination

LEARNING GOALS:

After reading this chapter, you should be able to:

- Identify the advantages and disadvantages of flexible and fixed exchange rates
- Understand the meaning of an optimum currency area
- Describe the creation of the euro and the operation of the European Central Bank
- Describe the operation of a currency board and how it works in the nations that adopted it
- Describe adjustable pegs, crawling pegs, and managed floating and how they work
- Know the meaning and importance of macroeconomic policy coordination

20.1 Introduction

In Chapters 16 through 19, we examined separately the process of adjustment to balance-of-payments disequilibria under a flexible and under a fixed exchange rate system. In this chapter, we evaluate and compare the advantages and disadvantages of a flexible as opposed to a fixed exchange rate system, as well as the merits and drawbacks of hybrid systems that combine various characteristics of flexible and fixed exchange rates.

In general, advocates of flexible exchange rates argue that such a system is more efficient than a system of fixed exchange rates to correct balance-of-payments disequilibria. Furthermore, they stress that by allowing a nation to achieve external balance easily and automatically, flexible rates facilitate the achievement of internal balance and other economic objectives of the nation. On the other hand, advocates of fixed exchange rates argue that by introducing a degree of uncertainty not present under fixed rates, flexible exchange rates reduce the volume of international trade and investment, are more likely to lead to destabilizing speculation, and are inflationary.

A careful review of the theoretical arguments raised by each side does not lead to any clear-cut conclusion that one system is overwhelmingly superior to the other. To be sure, at the time of the collapse of the fixed exchange rate system in the early 1970s, the majority of economists seemed to lean toward flexible exchange rates. However, as a result of the great volatility in exchange rates experienced over the past four decades, the balance today seems to be toward fixed or more managed rates. It seems that economists often compare the painfully obvious weaknesses of whatever the prevailing exchange rate system is to an idealized alternative system. This is contrasted to the more or less consistent preference of businesspeople, bankers, and government officials for fixed rates, or at least greatly restrained fluctuations.

No one can deny the important benefits of having a single currency throughout a nation and thus *permanently* fixed exchange rates between the various areas of the nation. (For example, a dollar in New York can be exchanged for a dollar in San Francisco or in any other part of the United States.) But then the debate over fixed versus flexible exchange rates becomes essentially a debate over what is an *optimum currency area*, or how large the area covered by permanently fixed exchange rates can be before the benefits of fixed rates are overcome by their drawbacks. In the final analysis, whether flexible or fixed exchange rates are better may very well depend on the nation or region involved and the conditions under which it operates.

In Section 20.2, we examine the case for flexible exchange rates, and in Section 20.3, the case for fixed exchange rates. Section 20.4 presents the closely related theory of optimum currency areas and discusses the European Monetary System. Section 20.5 looks at currency board arrangements and dollarization, while Section 20.6 examines the advantages and disadvantages of hybrid systems that combine some of the characteristics of flexible and fixed exchange rates in various degrees. These include systems with different exchange rate bands of fluctuation about a par value or a fixed exchange rate system characterized by adjustable pegs, crawling pegs, and managed floating. Finally, Section 20.7 deals with international macroeconomic policy coordination. The appendix presents the exchange rate arrangements of all IMF member countries.

20.2 The Case for Flexible Exchange Rates

We saw in Chapter 16 that under a truly flexible exchange rate system, a deficit or surplus in the nation's balance of payments is automatically corrected by a depreciation or an appreciation of the nation's currency, respectively, without any government intervention and loss or accumulation of international reserves by the nation. On the other hand, pegging or fixing the exchange rate at one level, just as fixing by law the price of any commodity, usually results in excess demand for or excess supply of foreign exchange (i.e., a deficit or a surplus in the nation's balance of payments), which can only be corrected by a change in economic variables other than the exchange rate. This is inefficient, may lead to policy mistakes, and requires the use of policies (such as monetary policy) that, therefore, are not available to achieve purely internal economic objectives.

20.2A Market Efficiency

Under a flexible exchange rate system, only the exchange rate needs to change to correct a disequilibrium in a nation's balance of payments. Balance-of-payments equilibrium would also be achieved under a fixed exchange rate system (such as the price-specie-flow mechanism under the gold standard) if all internal prices were perfectly flexible in the nation. However, it is argued that it is more efficient or less costly to change only one price (i.e., the exchange rate) than to rely on all internal prices changing in order to bring about adjustment in the balance of payments. The reasoning is the same as that for changing to daylight saving time during the summer months rather than rescheduling all events for one hour earlier. Furthermore, internal prices are sticky and far from perfectly flexible in today's world, especially downward.

According to its advocates, a flexible exchange rate system corrects balance-of-payments disequilibria smoothly and continuously as they occur. This results in stabilizing speculation, which dampens fluctuations in exchange rates. Whatever fluctuations remain in exchange rates can then be hedged at a small cost. On the other hand, the inability or unwillingness of a nation to adjust the exchange rate when out of equilibrium under a fixed exchange rate system is likely to give rise to destabilizing speculation and eventually force the nation to make a large discrete change in its exchange rate. This jolts the economy, imposes serious adjustment costs on the nation, and interferes with the smooth flow of international trade and investments.

Flexible exchange rates clearly identify the degree of comparative advantage and disadvantage of the nation in various commodities when these equilibrium exchange rates are translated into domestic prices. On the other hand, fixed exchange rates are often out of equilibrium in the real world, and when this is the case, they distort the pattern of trade and prevent the most efficient allocation of resources throughout the world.

For example, an exchange rate that is too high may lead the nation to export more of a commodity than would be justified at the equilibrium exchange rate. In extreme cases, it may even lead the nation to export a commodity in which, in reality, the nation has comparative *disadvantage*. That is, the commodity may be cheaper in relation to competitive foreign commodities (when expressed in terms of the same currency) at the nation's undervalued exchange rate even though it would be more expensive at the equilibrium exchange rate. This interferes with the most efficient utilization of world resources and reduces the benefits from international specialization in production and trade.

20.2B Policy Advantages

A flexible exchange rate system also means that the nation need not concern itself with its external balance and is free to utilize all policies at its disposal to achieve its purely domestic goals of full employment with price stability, growth, an equitable distribution of income, and so on. For example, we saw in Chapters 18 and 19 that under a fixed exchange rate system, the nation could use fiscal policy to achieve internal balance and monetary policy to achieve external balance. Other things being equal, the achievement of internal balance would certainly be facilitated if monetary policy were also free to be used alongside fiscal policy to attain this goal, or monetary policy could be utilized to achieve other purely internal objectives, such as growth. In view of the limited number of effective policy instruments usually available to nations, this is no small benefit. In addition, the possibility of policy mistakes and delays in achieving external balance would also be minimized under a flexible exchange rate system.

An additional standard argument for flexible exchange rates is that they enhance the effectiveness of monetary policy (in addition to freeing it to be used for domestic objectives). For example, an anti-inflationary policy that improves the trade balance will result in an appreciation of the domestic currency. This further reduces domestic inflationary pressures by encouraging imports and discouraging exports.

Different nations also have different trade-offs between inflation and unemployment. For example, the United Kingdom and Italy seemed to tolerate double-digit inflation more readily than the United States to keep their unemployment rates low during the 1970s. Japan also seemed more willing than Germany to tolerate inflation to keep its unemployment rate very low. Flexible exchange rates allow each nation to pursue domestic policies aimed at reaching its own desired inflation–unemployment trade-off. Under fixed exchange rates, different inflationary rates in different nations result in balance-of-payments pressures (deficit in the more inflationary nations and surplus in the less inflationary nations), which restrain or prevent each nation from achieving its optimum inflation–unemployment trade-off. However, the benefit from flexible exchange rates along these lines may be only temporary.

Flexible exchange rates would also prevent the government from setting the exchange rate at a level other than equilibrium in order to benefit one sector of the economy at the expense of another or to achieve some economic objective that could be reached by less costly means. For example, developing nations usually maintain an exchange rate that is too low in order to encourage the importation of capital equipment needed for development. However, this discourages exports of agricultural and traditional commodities. The government then uses a maze of exchange and trade controls to eliminate the excess demand for foreign exchange resulting at its lower-than-equilibrium exchange rate. Other things being equal, it would be more efficient to allow the exchange rate to find its own equilibrium level and give a subsidy to the nation's industrial producers. This is generally better because a subsidy is more transparent and comes under legislative scrutiny, and because trade and exchange controls introduce many distortions and inefficiencies into the economy. As indicated in Section 11.5C, many developing nations moved in this direction during the 1990s.

Finally, a flexible exchange rate system does not impose the cost of government interventions in the foreign exchange market required to maintain fixed exchange rates. Flexible exchange rates are generally preferred by those, such as Nobel laureate Milton Friedman, who advocate a minimum of government intervention in the economy and a maximum of personal freedom.

The above represents the strongest possible case that could be made for flexible exchange rates, and while generally correct in its broad outlines, it needs to be greatly qualified. This is undertaken in the next two sections in the context of making a case for fixed exchange rates and in examining the theory of optimum currency areas. Also to be pointed out is that we are here examining the case for a freely floating exchange rate system in which there is no government intervention at all in foreign exchange markets. A system that permits even a minimum of government intervention in foreign exchange markets simply to smooth out excessive short-run fluctuations without affecting long-run trends or trying to support any specific set of exchange rates does not qualify as a truly flexible exchange rate system. This is referred to as a managed floating exchange rate system and will be examined in Section 20.6D.

20.3 The Case for Fixed Exchange Rates

In this section, we consider the case for fixed exchange rates. This rests on the alleged smaller degree of uncertainty that fixed exchange rates introduce into international trade and finance, on fixed exchange rates being more likely to lead to stabilizing rather than to destabilizing speculation, and on the greater price discipline (i.e., less inflation) than under flexible rates. Each of these arguments in favor of fixed exchange rates is presented together with the reply by advocates of flexible exchange rates as well as whatever empirical evidence is available on the issue.

20.3A Less Uncertainty

According to its advocates, a fixed exchange rate system avoids the wild day-to-day fluctuations that are likely to occur under flexible rates and that discourage specialization in production and the flow of international trade and investments. That is, with flexible exchange rates, the day-to-day shifts in a nation's demand for and supply of foreign exchange would lead to very frequent changes in exchange rates. Furthermore, because the demand and supply curves of foreign exchange are supposedly inelastic (i.e., steeply inclined), not only would exchange rates fluctuate frequently, but these fluctuations would be very large. These wild fluctuations in exchange rates would interfere with and reduce the degree of specialization in production and the flow of international trade and investments. In this form, the case in favor of fixed rates is as much a case *against* flexible exchange rates as it is a case in favor of fixed rates as such.

For example, in Figure 20.1, the shift over time in the U.S. demand curve for euros from the average of $D_€$ to $D'_€$ and then to $D^*_€$ causes the exchange rate to fluctuate from R' to R^* when the U.S. supply curve of euros is $S_€$, or more elastic, and from R'' to R^{**} when the U.S. supply curve of euros is $S'_€$, or less elastic.

Turning to the real world and back to Figure 14.3, we see that the exchange rate between the U.S. dollar and the currencies of the largest *(G-7)* industrial nations did fluctuate widely on a daily basis from 1980 to 2002. Since 1973, most nations have had managed rather than freely floating exchange rates. To the extent that the intervention of national monetary authorities in foreign exchange markets had some success in their alleged aim of smoothing out short-run fluctuations in exchange rates, fluctuations in exchange rates would have been even greater under a freely floating exchange rate system.

The question of time is also crucial. That is, elasticities are likely to be higher and thus exchange rate fluctuations lower in the long run than in the short run. But it is with the short-run instability in exchange rates that we are now primarily concerned. Excessive short-run fluctuations in exchange rates under a flexible exchange rate system may be costly in terms of higher frictional unemployment if they lead to over-frequent attempts at reallocating domestic resources among the various sectors of the economy. The short-run tendency of exchange rates to overshoot their long-run equilibrium level has also been noted in Section 15.5A and Case Study 15-7.

According to advocates of flexible exchange rates, the uncertainty and instability surrounding the large discrete changes in par values that periodically become necessary under a fixed exchange rate system are even more damaging and disruptive to the smooth flow of international trade and investments than the uncertainty inherent in fluctuating exchange rates. Furthermore, while the latter uncertainty can generally be hedged, the former cannot.

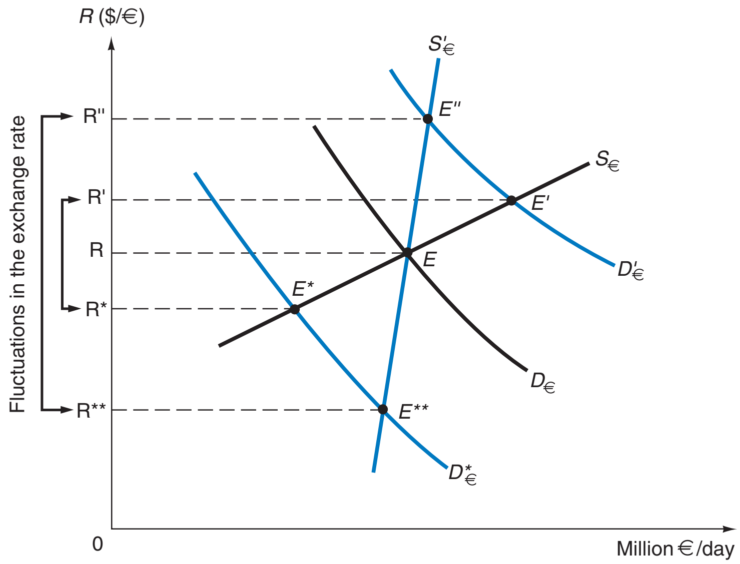

FIGURE 20.1. Shifts in the Nation's Demand Curve for Foreign Exchange and Uncertainty. The shift over time in the U.S. demand curve for euros from the average $D_€$ to $D'_€$ and then to $D^*_€$ causes the exchange rate to fluctuate from R' to R^* when the U.S. supply curve of euros is $S_€$, or elastic, and from R'' to R^{**} when the U.S. supply curve is $S'_€$, or inelastic.

However, it must be pointed out that under a *truly* fixed exchange rate system, such as the gold standard, the exchange rate is always kept fixed, and so this source of uncertainty would be absent.

20.3B Stabilizing Speculation

According to advocates of fixed exchange rates, speculation is more likely to be *destabilizing* under a flexible than under a fixed exchange rate system. With destabilizing speculation, speculators purchase a foreign currency when the exchange rate is rising, in the expectation that the exchange rate will rise even more, and sell the foreign currency when the exchange rate is falling, in the expectation that the exchange rate will fall even more. In the process, the fluctuations in exchange rates resulting from business cycles are amplified, and so are the uncertainty and risks involved in international transactions. The opposite occurs under stabilizing speculation.

This is illustrated in Figure 20.2. Curve *A* shows the hypothetical fluctuation in the exchange rate that accompanies the business cycle in the absence of speculation (along an implicit depreciating trend of the dollar over the entire cycle). Curve *B* shows the smaller fluctuation in the exchange rate with stabilizing speculation, and curve *C* shows the larger fluctuation in the exchange rate with destabilizing speculation. The amplified fluctuations in exchange rates with destabilizing speculation increase the uncertainty and risk of international transactions and reduce the international flow of trade and investments. According to advocates of a fixed exchange rate system, this is more likely to occur when exchange rates are free to vary than when they are kept fixed.

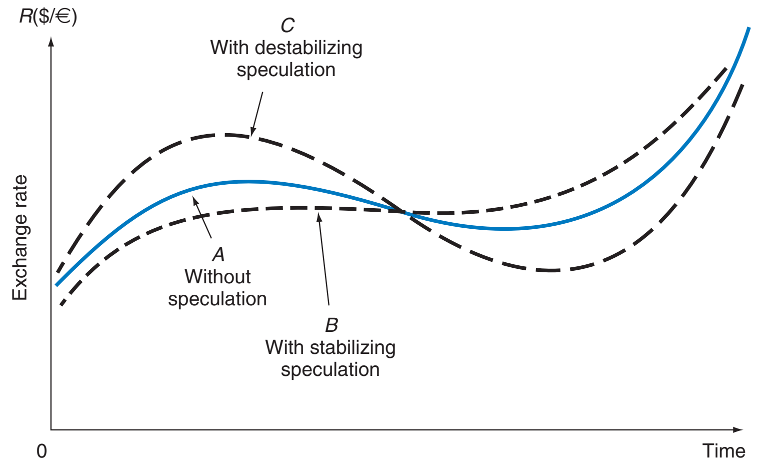

FIGURE 20.2. Fluctuations in Exchange Rate in the Absence of Speculation and with Stabilizing and Destabilizing Speculation.
Curve *A* shows the fluctuation in the exchange rate over the business cycle in the absence of speculation. Curve *B* shows the smaller fluctuation in the exchange rate with stabilizing speculation, while curve *C* shows the larger fluctuation in the exchange rate with destabilizing speculation.

Once again, advocates of flexible exchange rates disagree. They point out that destabilizing speculation is less likely to occur when exchange rates adjust continuously than when they are prevented from doing so until a large discrete adjustment can no longer be avoided. Anticipating a large change in exchange rates, speculators will then sell a currency that they believe is going to be devalued and buy a currency that they believe is going to be revalued (destabilizing speculation), and their expectations often become self-fulfilling. However, this is generally true only under a fixed exchange rate system of the Bretton Woods type, which did allow exchange rate changes in cases of "fundamental disequilibrium." Under a *truly* fixed exchange rate system, such as the gold standard, exchange rates are always kept fixed, and a balance-of-payments adjustment is achieved by other means, no matter how painful. In that case, speculation is almost certain to be stabilizing. But then that is also likely to be the case under a *truly* flexible exchange rate system.

According to Milton Friedman, speculation is stabilizing on the average because destabilizing speculation would lead to continuous losses by speculators, which would drive them out of business. That is, with destabilizing speculation, speculators buy a foreign currency when its price is rising in the expectation that its price will rise even more, but if it does not, they are forced to resell the currency at a lower price, thus incurring losses. If the process continues, it will bankrupt many of them. For speculators to make profits and remain in business, they must be able to purchase a foreign currency when it is cheap and resell it when it is expensive. This implies that speculation is stabilizing on the average. Some economists reject this argument and point out that the ranks of speculators who behave in a destabilizing manner are always replenished so that speculation can be destabilizing over a long period of time. Furthermore, the fact that destabilizing speculation would bankrupt them did not prevent speculators from behaving in a destabilizing fashion during the stock market crash in 1929 at the start of the Great Depression and more recently during the stock market crash of October 1987.

This is one of those arguments that could possibly be resolved only by examining real-world experiences. But when we turn to these, we find conflicting evidence. The interwar experience (i.e., between World War I and World War II) with flexible exchange rates clearly indicated the prevalence of destabilizing speculation, according to *Nurkse* (but this has more recently been subject to revision). This interwar experience strongly influenced the Allies at the close of World War II to establish a fixed exchange rate system (the Bretton Woods system). The Canadian experience with flexible exchange rates during the 1950s, however, showed that stabilizing speculation was prevalent.

The last days of the Bretton Woods system in the early 1970s were marred by chaotic conditions in foreign exchange markets, several exchange rate realignments, and clearly destabilizing speculation. On the other hand, the gold standard period (1880–1914) was definitely a time of stabilizing speculation. Under the managed floating system in operation since 1973, exchange rates have fluctuated widely on a daily basis, but there is no general agreement on whether speculation has been stabilizing or destabilizing on average. Perhaps there has been some of both.

Thus, destabilizing speculation can occur under a managed floating system of the type in operation today as well as under a fixed exchange rate system of the Bretton Woods type. However, a majority of economists seem to believe that, under “normal” conditions, speculation was for the most part stabilizing under both systems. Under a *truly* flexible and a *truly* fixed exchange rate system, speculation is almost certain to be stabilizing.

20.3c Price Discipline

Fixed exchange rates impose a price discipline on the nation not present under flexible exchange rates (the so-called anchor argument). That is, a nation with a higher rate of inflation than the rest of the world is likely to face persistent deficits in its balance of payments and loss of reserves under a fixed exchange rate system. Since deficits and reserve losses cannot go on forever, the nation needs to restrain its excessive rate of inflation and thus faces some price discipline. There is no such price discipline under a flexible exchange rate system, where balance-of-payments disequilibria are, at least in theory, automatically and immediately corrected by changes in the exchange rate. Knowing this, elected officials are more likely to overstimulate the economy in order to increase their chances of reelection.

On theoretical grounds, flexible exchange rates do seem more inflationary than fixed exchange rates. We saw in Chapter 16 that the depreciation of a nation’s currency increases domestic prices. On the other hand, an appreciation does not result in a reduction in prices because of the downward inflexibility of prices in today’s world. To be sure, a devaluation under a fixed exchange rate system is also inflationary, while a revaluation fails to reduce domestic prices. However, since fluctuating exchange rates lead to overshooting of the equilibrium exchange rate in both directions and cause prices to rise when depreciating but fail to reduce prices when appreciating (the so-called ratchet effect), inflation is likely to be higher under a flexible than under a fixed exchange rate system.

As pointed out earlier, we have had no real-world experience with *truly* flexible exchange rates, and so we must rely on the experience under the managed floating system. Managed floating since 1973 has coincided with sharp inflationary pressures throughout most of the world until the early 1980s, but not afterward. Furthermore, the inflationary pressures during the 1970s were as much, or even primarily, the result of the sharp increase in petroleum prices and excessive money creation in most nations (and the resulting inflationary psychology) as of flexible exchange rates, as such. However, even if we exclude the more unstable years of the 1970s, we find that the economic performance of the leading industrial countries was better during the 1960–1973 period than during the 1983–2011 period (see Case Study 20-1).

Advocates of a flexible exchange rate system acknowledge that flexible rates can be more inflationary than fixed exchange rates. However, this results because nations desire different

■ CASE STUDY 20-1 Macroeconomic Performance under Fixed and Flexible Exchange Rate Regimes

Table 20.1 presents some indicators of the macroeconomic performance of the leading industrial (G-7) countries during the last 14 years of the fixed exchange rate period (i.e., from 1960 to 1973) and the 28 years from 1983 to 2011 of the present flexible (managed) exchange rate period. The years from 1974 to 1982 were excluded because the petroleum crises of 1973–1974 and 1979–1980 (and their aftermath) made this period quite unusual. The table shows that the rate of growth or real GDP was, on average, double, the rate of inflation was 50 percent higher, and the rate of unemployment was less than half during the fixed exchange rate period as compared with the flexible exchange rate period examined.

We cannot, however, attribute the better macroeconomic performance during the 1960–1973 period entirely or even primarily to fixed exchange rates because economic performance depends on many other factors, such as flexibility of labor markets, rate of technological change, and globalization. For example, rapid globalization may be responsible for the lower inflation rate during the managed exchange rate regime (despite the fact that we would expect the former to be less inflationary than the latter). In fact, when all the sources affecting economic performance are taken into consideration, it becomes difficult to say which system is better. It really depends on the nation and the circumstances under which it operates. In the final analysis, no exchange rate regime can substitute for sound economic policies.

■ TABLE 20.1. Macroeconomic Performance under Fixed and Flexible Exchange Rates, 1960–1973, 1983–2011

	Real GDP Growth		Inflation Rate		Unemployment Rate	
Country	1960–1973	1983–2011	1960–1973	1983–2011	1960–1973	1983–2011
United States	3.7%	3.1%	2.8%	2.9%	4.9%	6.3%
Japan	11.0	2.0	5.6	0.6	1.2	3.5
Germany	5.5	1.9	2.9	1.9	0.6	7.7
United Kingdom	2.9	2.1	4.5	3.3	2.8	7.5
France	6.0	1.9	4.3	2.7	1.8	9.9
Italy	5.7	1.4	3.8	4.3	3.1	9.2
Canada	5.0	2.8	2.8	2.8	5.1	8.8
Weighted average	5.7	2.2	3.8	2.6	2.8	7.6

Sources: Organization for Economic Cooperation and Developement, *Economic Outlook* (Paris: OECD, various issues); A. Ghosh, J. D. Ostry, and C. Tsangarides, *Exchange Rate Regimes and the Stability of the International Monetary System* (Washington, D.C.: IMF, 2010); and J. E. Gagnon, *Flexible Exchange Rates for a Stable World Economy* (Washington, D.C.: Peterson Institute for International Economics, 2011).

inflation–unemployment trade-offs and flexible exchange rates allow each nation to pursue its own stabilization policies—that is, to trade more inflation for less unemployment (or vice versa) as the nation sees fit. Advocates of flexible exchange rates view this as an important advantage of a flexible exchange rate system.

Flexible exchange rates to a large extent insulate the domestic economy from *external* shocks (such as an exogenous change in the nation's exports) much more than do fixed exchange rates. As a result, flexible rates are particularly attractive to nations subject to large external shocks. On the other hand, a fixed exchange rate system provides more stability to an open economy subject to large *internal* shocks.

For example, an autonomous increase in investment in the nation increases the level of national income according to the familiar multiplier process. The increase in income induces imports to rise and possibly causes a deficit in the nation's balance of payments under a fixed exchange rate system. At least for a time, the nation can finance the deficit out of its international reserves. Under a flexible exchange rate system, however, the nation's currency will automatically depreciate and stimulate its exports, which reinforces the tendency for the nation's income to rise. But the outcome can vary greatly when international capital flows are also considered. Furthermore, since 1973, business cycles seem to have become more, rather than less, synchronized even though exchange rates are floating.

By way of a summary, we might say that a flexible exchange rate system does not seem to compare unfavorably to a fixed exchange rate system as far as the type of speculation to which it gives rise and the degree of uncertainty that it introduces into international transactions when all factors are considered. Furthermore, flexible exchange rates are generally more efficient and do give nations more flexibility in pursuing their own stabilization policies. At the same time, flexible exchange rates are generally more inflationary than fixed exchange rates and less stabilizing and suited for nations facing large internal shocks. The greatest attraction of flexible exchange rates as far as monetary authorities are concerned is that they allow the nation to retain greater control over its money supply and possibly achieve a lower rate of unemployment than would be possible under a fixed or adjustable peg exchange rate system. However, this benefit is greatly reduced when, as in today's world, international capital flows are very large. The greatest disadvantage of flexible exchange rates is the lack of price discipline and the large day-to-day volatility and overshooting of exchange rates.

In general, a fixed exchange rate system is preferable for a small open economy that trades mostly with one or a few larger nations and in which disturbances are primarily of a monetary nature. On the other hand, a flexible exchange rate system seems superior for a large, relatively closed economy with diversified trade and a different inflation–unemployment trade-off than its main trading partners, and facing primarily disturbances originating in the real sector abroad.

20.3D The Open-Economy Trilemma

From the discussion thus far, we can see that in an open economy, policymakers face a policy trilemma in trying to achieve internal and external balance. They can attain only two of the following three policy choices: (1) a fixed exchange rate, (2) unrestricted international financial or capital flows, and (3) monetary policy autonomy, or independence. The nation can have a fixed exchange rate and unrestricted international financial flows (choices 1

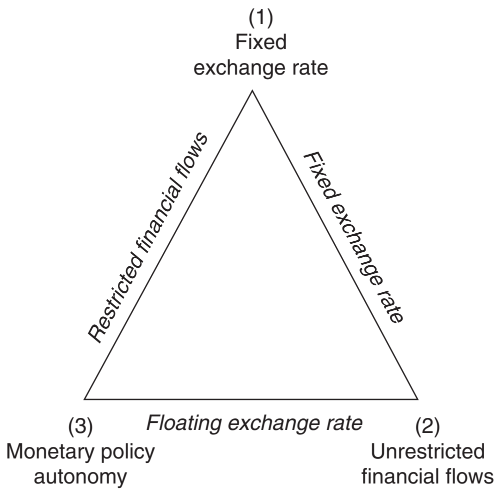

FIGURE 20.3. The Policy Trilemma for Open Economies.
Each corner of the triangle shows one policy choice open to the nation. The nation can attain only two of the three.

and 2) only by giving up monetary policy autonomy (choice 3); or it can have a fixed exchange rate and monetary policy autonomy (choices 1 and 3) only by restricting or controlling international financial flows (choice 2); or finally, it can have monetary policy autonomy and unrestricted international financial flows (choices 2 and 3) only by giving up a fixed exchange rate (choice 1).

The three policy trilemma that policymakers face in an open economy are shown by the corners of the triangle in Figure 20.3. If the nation chooses a fixed exchange rate and unrestricted international financial flows (the right leg of the triangle), it must give up monetary policy autonomy (as under the gold standard or any other rigidly fixed exchange rate system—see Section 16.6). In this case, a deficit nation will have to allow its money supply to fall for its trade and balance of payments deficit to be corrected (the opposite would be the case for a surplus nation). Conversely, if the nation chooses a fixed exchange rate and monetary policy autonomy (the left leg of the triangle), the nation must restrict international financial flows so as to retain control over its money supply. Finally, if the nation chooses to have monetary policy autonomy and unrestricted international financial flows, it cannot have a fixed exchange rate (i.e., it must accept a flexible exchange rate, as shown in the bottom leg of the triangle). Of course, a nation could choose an intermediate policy—for example, by accepting some exchange rate flexibility with either some loss of monetary policy autonomy or imposing some controls over international financial flows (or some of both).

20.4 Optimum Currency Areas, the European Monetary System, and the European Monetary Union

In this section we examine the theory of optimum currency areas, the European Monetary System, and the European Monetary Union with the creation of the European Central Bank and the common currency (the euro).

20.4A Optimum Currency Areas

The theory of optimum currency areas was developed by *Robert Mundell and Ronald McKinnon* during the 1960s. We are particularly interested in this theory for the light that it can shed on the conflict over fixed versus flexible exchange rates. An optimum currency area or bloc refers to a group of nations whose national currencies are linked through *permanently* fixed exchange rates and the conditions that would make such an area optimum. The currencies of member nations could then float jointly with respect to the currencies of nonmember nations. Obviously, regions of the same nation, sharing as they do the same currency, are optimum currency areas.

The formation of an optimum currency area eliminates the uncertainty that arises when exchange rates are not permanently fixed, thus stimulating specialization in production and the flow of trade and investments among member regions or nations. The formation of an optimum currency area also encourages producers to view the entire area as a single market and to benefit from greater economies of scale in production.

With permanently fixed exchange rates, an optimum currency area is likely to experience greater price stability than if exchange rates could change between the various member nations. The greater price stability arises because random shocks in different regions or nations within the area tend to cancel each other out, and whatever disturbance may remain is relatively smaller when the area is increased. This greater price stability encourages the use of money as a store of value and as a medium of exchange, and discourages inefficient barter deals arising under more inflationary circumstances. An optimum currency area also saves the cost of official interventions in foreign exchange markets involving the currencies of member nations, the cost of hedging, and the cost of exchanging one currency for another to pay for imports of goods and services and when citizens travel between member nations (if the optimum currency area also adopts a common currency).

Perhaps the greatest disadvantage of an optimum currency area is that each member nation cannot pursue its own independent stabilization and growth policies attuned to its particular preferences and circumstances. For example, a depressed region or nation within an optimum currency area might require expansionary fiscal and monetary policies to reduce an excessive unemployment rate, while the more prosperous region or nation might require contractionary policies to curb inflationary pressures. To some extent, this cost of an optimum currency area is compensated by the ability of workers to emigrate from the poorer to the richer members and by greater capital inflows into the poorer members. Despite the fact that national differences are likely to persist, few would suggest that poorer nations or regions would do better by not entering into or seceding from an optimum currency area or nation. (In December 1971, however, East Pakistan, charging exploitation, did break away from West Pakistan and proclaimed itself Bangladesh, and Quebec has threatened to secede from Canada for economic as well as cultural reasons.) Furthermore, poorer nations or regions usually receive investment incentives and other special aid from richer members or areas.

The formation of an optimum currency area is more likely to be beneficial on balance under the following conditions: (1) the greater the mobility of resources among the various member nations, (2) the greater their structural similarities, and (3) the more willing they are to closely coordinate their fiscal, monetary, and other policies. An optimum currency area should aim at maximizing the benefits from permanently fixed exchange rates and minimizing the costs. It is not easy, however, to actually measure the net benefits accruing to each member nation or region from joining an optimum currency area.

To be noted is that some of the benefits provided by the formation of an optimum currency area can also be obtained under the looser form of economic relationship provided by fixed exchange rates. Thus, the case for the formation of an optimum currency area is to some extent also a case for fixed as opposed to flexible exchange rates. The theory of optimum currency areas can be regarded as the special branch of the theory of customs unions (discussed in Chapter 10) that deals with monetary factors.

20.4B European Monetary System (1979–1998)

In March 1979, the European Union or EU (then called the European Economic Community or EEC) announced the formation of the European Monetary System (EMS) as part of its aim toward greater monetary integration among its members, including the ultimate goal of creating a common currency and a Community-wide central bank. The main features of the EMS were (1) the European Currency Unit (ECU), defined as the weighted average of the currencies of the member nations, was created. (2) The currency of each EU member was allowed to fluctuate by a maximum of 2.25 percent on either side of its central rate or parity (6 percent for the British pound and the Spanish peseta; Greece and Portugal joined later). The EMS was thus created as a fixed but adjustable exchange rate system and with the currencies of member countries floating jointly against the dollar. Starting in September 1992, however, the system came under attack, and in August 1993 the range of allowed fluctuation was increased from 2.25 percent to 15 percent (see Case Study 20-2). (3) The European Monetary Cooperation Fund (EMCF) was established to provide short- and medium-term balance-of-payments assistance to its members.

When the fluctuation of a member nation's currency reached 75 percent of its allowed range, a *threshold of divergence* was reached, and the nation was expected to take a number of corrective steps to prevent its currency from fluctuating outside the allowed range. If the exchange rate did reach the limit of its range, intervention burdens were to be shared symmetrically by the weak- and the strong-currency member. For example, if the French franc depreciated to its upper limit against the German mark, then the French central bank had to sell Deutsche mark (DM) reserves and the German central bank (the Bundesbank) had to lend the necessary DM to France.

Member nations were assigned a quota in the EMCF, 20 percent to be paid in gold (valued at the market price) and the remainder in dollars, in exchange for ECUs. The amount of ECUs grew rapidly as member nations converted more and more of their dollars and gold into ECUs. Indeed, ECUs became an important international asset and intervention currency. One advantage of the ECU was its greater stability in value with respect to any one national currency. It was anticipated that the EMCF would eventually evolve into an EU central bank. By the beginning of 1998, the total reserve pool of the EMCF was over \$50 billion and the value of the ECU was \$1.1042.

From March 1979 to September 1992, there was a total of 11 currency realignments of the EMS. In general, high-inflation countries such as Italy and France (until 1987) needed to periodically devalue their currency with respect to the ECU in order to maintain competitiveness in relation to a low-inflation country such as Germany. This points to the fundamental weakness of the EMS in attempting to keep exchange rates among member nations within narrowly defined limits without at the same time integrating their monetary, fiscal, tax, and other policies. As pointed out by *Fratianni and von Hagen* (1992), inflation in Italy

CASE STUDY 20-2 The 1992–1993 Currency Crisis in the European Monetary System

In September 1992, the United Kingdom and Italy abandoned the exchange rate mechanism (ERM), which allowed EU currencies to fluctuate only within narrowly defined limits, and this was followed by devaluations of the Spanish peseta, Portuguese escudo, and Irish pound between September 1992 and May 1993. High German interest rates to contain inflationary pressures (resulting from the high cost of restructuring East Germany) made the German mark strong against other currencies and have been widely blamed for the tensions in the EMS. In the face of deepening recession and high and rising unemployment, the United Kingdom and Italy felt that the cost of keeping exchange rates within the ERM had become unbearable and so they abandoned it. This allowed their currencies to depreciate and their interest rates to be lowered—both of which stimulated growth.

But this was not the end of the crisis. When the Bundesbank (the German central bank) refused to lower the discount rate, as many financial analysts and currency traders had expected in August 1993, speculators responded by unloading the currencies of France, Denmark, Spain, Portugal, and Belgium with a vengeance. (The United Kingdom and Italy had already left the ERM and were not directly affected.) After massive interventions in foreign exchange markets, especially by the Bank of France in concert with Bundesbank, failed to put an end to the massive speculative attack, European Union finance ministers agreed to abandon the narrow band of fluctuation of ± 2.25 percent for a much wider band of ± 15 percent on either side of their central rates.

During the crisis, the Bundesbank sold more than \$35 billion worth of marks in support of the franc and other currencies, and the total spent on market intervention by all the central banks involved may have exceeded \$100 billion. But with more than \$1 trillion moving each day through foreign exchange markets, even such massive intervention could not reverse market forces in the face of a massive speculative attack. Greatly widening the band of allowed fluctuation put an end to the speculative attack, but exchange rates remained close to their precrisis level.

Source: D. Salvatore, "The European Monetary System: Crisis and Future," *Open Economies Review*, December 1996, pp. 593–615.

and France during the 1979–1987 period was restrained by the presence of Germany in the EMS, and this reduced the need for higher real appreciations of the Deutsche mark. France and Italy, however, paid a price in terms of greater unemployment for the gradual convergence toward Germany's low inflation rate. The EU's desire to stabilize exchange rates was understandable in view of the large exchange rate fluctuations since 1973 (see Case Study 20-2). Empirical evidence (see *Giavazzi and Giovannini*, 1989, and *MacDonald and Taylor*, 1991) indicates that variations in nominal and real exchange rates and money supplies among EMS members were smaller than among nonmembers, at least until September 1992.

20.4c Transition to Monetary Union

In June 1989, a committee headed by Jacques Delors, the president of the European Commission, recommended a three-stage transition to the goal of monetary union. The first stage, which started in July 1990, called for convergence of economic performance and cooperation in monetary and fiscal policy, as well as the removal of all restrictions to intra-Community capital movements. The second stage, approved at a meeting in the Dutch city of Maastricht in December 1991, called for the creation of a European Monetary Institute (EMI) as the forerunner of a European Central Bank (ECB) to further centralize members' macroeconomic policies and reduce exchange rate margins by January 1994. (The EMI was, in fact, established as scheduled in 1994.) The third stage was to involve the completion of the monetary union by either 1997 or 1999 with the establishment of a single currency and a European Central Bank that would engage in foreign exchange market interventions and open market operations. This meant that member nations relinquished sovereign power over their money supply and monetary policy. In addition, they would no longer have full freedom over their budget policies. With a common central bank, the central bank of each nation would assume functions not unlike those of Federal Reserve banks in the United States.

The Maastricht Treaty set several conditions before a nation could join the monetary union: (1) The inflation rate must not exceed by more than 1.5 percentage points the average rate of the three Community nations with the lowest rate; (2) its budget deficit must not exceed 3 percent of its GDP; (3) its overall government debt must not exceed 60 percent of its GDP; (4) long-term interest rates must not exceed by more than two points the average interest rate of the three countries with the lowest inflation rates; and (5) its average exchange rate must not fall by more than 2.25 percent of the average of the EMS for the two years before joining. By 1991, only France and Luxembourg had met all of these criteria. Because the cost of reunification pushed its budget deficit to 5 percent of its GDP, Germany did not meet all conditions for joining in 1991. Italy, with its budget deficit of 10 percent of GDP and overall debt of more than 100 percent of GDP, did not meet any of the conditions. By 1998, however, most member countries of the European Union had met most of the Maastricht criteria (see Case Study 20-3), and the stage was set for true monetary union.

In 1997, the Stability and Growth Pact (SGP) was negotiated to further tighten the fiscal constraint under which countries participating in the monetary union would operate. The SGP required member countries to aim at budget deficits smaller than 3 percent of GDP, so that in case of recession the nation could conduct expansionary fiscal policy and still remain below the 3 percent guideline. Nations that violated the fiscal indicator would be subject to heavy fines. Germany demanded the Pact as a condition for proceeding toward monetary union in order to make sure that fiscal discipline would prevail in the monetary union and avoid excessive money creation, inflation, and a weak euro. The irony is that it was precisely Germany (and France) that was unable to meet the SGP in 2003, when its budget deficit reached 4 percent of its GDP, and this led to the relaxation of the SGP's rules by adding some loopholes in 2005.

Throughout the negotiations, the United Kingdom tried consistently to slow the EU's moves toward greater economic and political union for fear of losing more of its sovereignty. The United Kingdom refused to promise that it would give up the pound sterling as its national currency or that it would accept Community-wide labor legislation. Differences in culture, language, and national temperament made progress toward monetary union difficult, and the future admission of the new democracies of Eastern and Central Europe was expected to greatly complicate matters. Nevertheless, the Maastricht Treaty operated as the bridge that led to true monetary union in Europe at the beginning of 1999, when the ECB (created in 1998) began to operate and the euro came into existence.

20.4D Creation of the Euro

At the beginning of 1999, the European Monetary System became the European Monetary Union (EMU) with the introduction of the euro and a common monetary policy by the European Central Bank. On January 1, 1999, the euro (€) came into existence as the common currency of 11 countries of the euro area or Euroland (Austria, Belgium, Germany, Finland,

CASE STUDY 20-3 Maastricht Convergence Indicators

Table 20.2 gives the value of four of the five Maastricht indicators for the 15 member countries of the European Union in January 1998. This information, together with the exchange rate indicator (not shown in the table) is what the European Commission used to determine which member nations were eligible to participate in the single currency. From the table we see that all countries, except Greece, satisfied the inflation, public deficit, and long-term interest indicators, but eight countries did not satisfy the public debt criterion. Furthermore, Ireland did not meet the exchange rate indicator. The European Commission, however, ruled that all countries (except Greece) had made sufficient progress for all to participate in the single currency. The United Kingdom, Denmark, and Sweden chose not to participate because of their unwillingness to lose complete control over their money supply and monetary policy, but they reserved the right to join later. Greece was admitted on January 1, 2001, Slovenia in 2007, Cyprus and Malta in 2008, Slovakia in 2009, and Estonia in 2011—thus increasing the number of members of the Eurozone countries to 17 (see Figure 20.4).

TABLE 20.2. EU Members' Maastricht Convergence Indicators, January 1998

	Inflation Rate (%)	Public Deficit[a] as % of GDP	Public Debt[a] as % of GDP	Long-term Interest Rate (%)
Germany	1.4	2.5	61.2[b]	5.6
France	1.2	2.9	58.1	5.5
Italy	1.8	2.5	118.1[b]	6.7
United Kingdom	1.8	0.6	52.3	7.0
Austria	1.1	2.3	64.7[b]	5.6
Belgium	1.4	1.7	118.1[b]	5.7
Denmark	1.9	−1.1	59.5	6.2
Greece	5.2[b]	2.2	107.7[b]	9.8[b]
Finland	1.3	−0.3	53.6	5.9
Ireland	1.2	−1.1	59.5	6.2
Luxembourg	1.4	−1.0	7.1	5.6
Netherlands	1.8	1.6	70.0[b]	5.5
Portugal	1.8	2.2	60.0	6.2
Spain	1.8	2.2	67.4[b]	6.3
Sweden	1.9	0.5	74.1[b]	6.5
EU average	1.6	1.9	70.5	6.1
Reference value	2.7	3.0	60.0	7.8

[a]Forecast.
[b]Country not satisfying criteria.
Source: European Commission, *Convergence Report 1999* (Brussels: European Commission, 1998).

(continued)

CASE STUDY 20-3 Continued

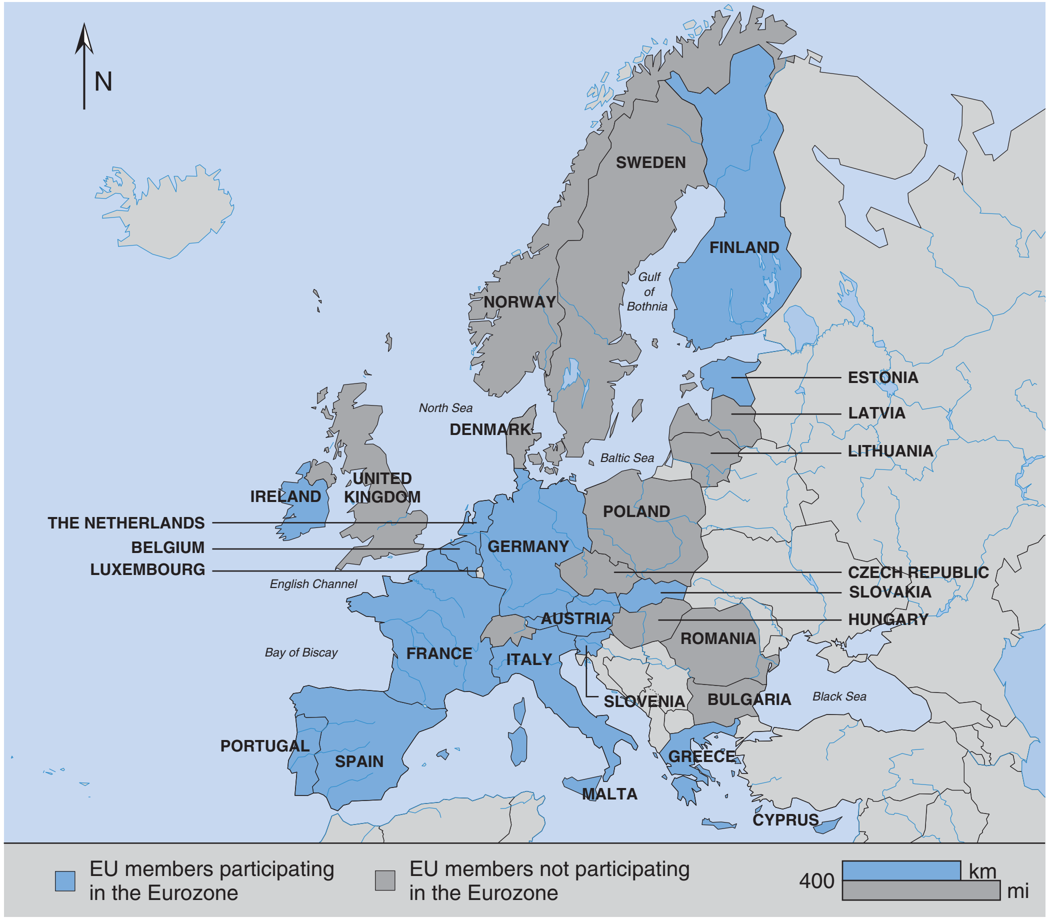

FIGURE 20.4. The Eurozone Countries as of the Beginning of 2012.
As of the beginning of 2012, the 17 members of the Eurozone were Austria, Belgium, Cyprus, Estonia, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Malta, the Netherlands, Portugal, Slovakia, Slovenia, and Spain.

France, Ireland, Italy, Luxembourg, Spain, Portugal, and the Netherlands). Greece was admitted on January 1, 2001. Britain, Sweden, and Denmark chose not to participate. The creation of the euro is one of the most important events in postwar monetary history: Never before had a large group of sovereign nations voluntarily given up their own currency for a common currency.

From January 1, 1999, euros were traded in financial markets, new issues of securities were denominated in euros, and official statistics in the euro area were quoted in euros, but euro bank notes and coins were not introduced until the beginning of 2002. That is, until that date, the euro was only a unit of account and not an actual physical circulating currency.

■ TABLE 20.3. Official Currency Conversion Rates for the Euro

Country	National Currency	Currency Units per Euro
Austria	schilling	13.7603
Belgium	Belgian franc	40.3399
Finland	markka	5.94573
France	French franc	6.55957
Germany	Deutsche mark	1.95583
Ireland	punt	0.787564
Italy	Italian lira	1936.27
Luxembourg	Luxembourg franc	40.3399
Netherlands	guilder	2.20371
Portugal	escudo	200.482
Spain	peseta	166.386

Source: ''The Launch of the Euro,'' *Federal Reserve Bulletin*, October 1999, pp. 655–666.

From January 1 until July 1, 2002, euros and national currencies circulated together for nations that so chose, but by July 1, 2002, all national currencies were phased out (taken out of circulation), and euro paper currency and coins became the sole legal tender in the 12 participating members of the euro area.

The value of the euro in terms of the participating currencies was decided in the fall of 1998 and became rigidly fixed (i.e., it could not be changed). The official euro conversion rates for the currencies of the participating countries are given in Table 20.3.

From January 1, 1999, until January 1, 2002, the exchange rate of the euro fluctuated in terms of other currencies, such as the U.S. dollar, the British pound, the Japanese yen, and so on, but the value of each participating currency remained rigidly fixed in terms of euros. This means that the exchange rates of the currencies participating in the euro fluctuated in relation to other currencies only to the extent that the euro fluctuated in relation to those other currencies. For example, if the dollar price of the euro is $1.10, the dollar value of the Deutsche mark is 10 percent higher than the Deutsche mark price of the euro, or 1.10×1.95583, which was equal to $2.151413. If, then, the euro depreciated to $1.05, the dollar price of the Deutsche mark became 1.05×1.95583, or $2.0536215.

In order to avoid excessive volatility and possible misalignments between the currencies of the United Kingdom, Sweden, and Denmark and the euro, the Exchange Rate Mechanism II (ERM II) was set up, similar to the one operating under the European Monetary System. As experience with the 1992–1993 ERM crisis showed, however, such a system is unstable and crisis prone. But it is in the interest of the United Kingdom, Sweden, and Denmark to limit even more the fluctuation of their currencies vis-à-vis the euro to facilitate their future possible adoption of the euro (see *Salvatore*, 2000). In June 2004, Estonia, Lithuania, and Slovenia joined ERM II with a 15 percent band of fluctuation around parity.

The euro was introduced on January 1, 1999, at the exchange rate of €1 = $1.17 but, contrary to most experts' opinion, it fluctuated downward to just below parity (i.e., €1 = $1) by the end of 1999. It actually fell to a low of $0.82 at the end of October 2000 before returning to near parity with the dollar by the middle of 2002. It then rose to a high of $1.36 in December 2004, to the all-time high of $1.63 in July 2008, and it was $1.32 in March 2012 (see Case Study 15-8). The creation of the euro provides major benefits to euro-area countries but also imposes significant costs, especially in the short run (see Case Study 20-4).

CASE STUDY 20-4 Benefits and Costs of the Euro

The adoption of the euro as the common currency of the euro-area countries confers major benefits on the participating countries, but it also led to significant costs. The benefits are: (1) elimination of the need to exchange currencies among euro-area members (this has been estimated to save as much as $30 billion per year); (2) elimination of exchange rate volatility among the currencies of participating countries; (3) more rapid economic and financial integration of participating nations; (4) the ability of the European Central Bank to conduct a more expansionary monetary policy than the one practically imposed by the German Bundesbank on other members of the European Union in the past; (5) greater economic discipline for countries such as Greece and Italy, which seemed unwilling or unable to put their houses in order without externally imposed conditions; (6) seignorage from use of the euro as an international currency (see Case Study 14-1); (7) reduced cost of borrowing in international financial markets; and (8) increased economic and political importance for the European Union in international affairs.

The most serious problem created by the adoption of the euro for the participating countries arises when only one or a few of them face a recession or some other asymmetric shock. The reason is that the nation or nations so affected can use neither exchange rate nor monetary policy to overcome the problem, and (as indicated) fiscal policy is also severely constrained or limited. In such a situation, the nation or nations must then wait for the problem to be resolved by itself, gradually, over time. In a more fully integrated economy, such as the United States, if a region is in a recession, some labor will immediately move out and the region will also benefit from a great deal of fiscal redistribution (such as greater unemployment insurance receipts). In the EMU, instead, labor mobility is much lower than in the United States, and so is fiscal redistribution. Thus, it will be much more difficult for a nation of the euro area to deal with an asymmetric shock. It is true that economic integration will encourage intra-EMU labor mobility, but this is a slow process that is likely to take years to complete. Capital mobility within the euro area, however, can to some extent substitute for inadequate labor mobility in overcoming the problem.

Sources: G. Fink and D. Salvatore, "Benefits and Costs of European Economic and Monetary Union," *The Brown Journal of World Affairs*, Summer/Fall 1999, pp. 187–194; D. Salvatore, "The Unresolved Problem with the EMS and EMU," *American Economic Review Proceedings*, May 1997, pp. 224–226; and D. Salvatore, "Euro," *Princeton Encyclopedia of the World Economy* (Princeton, N.J.: Princeton University Press, 2008), pp. 350–352.

20.4E The European Central Bank and the Common Monetary Policy

In 1998, the European Central Bank (ECB) was established as the operating arm of the *European System of Central Banks (ESCB)*, a federal structure of the national central banks of the European Union. In January 1999, the ECB assumed responsibility for the common EMU monetary policy. ECB's monetary decisions are made by a majority vote of the governing council, composed of a six-member executive board (including the president of the ECB, who was Willem F. Duisenberg of the Netherlands until 2003, Jean-Claude Trichet of France until 2011, and Mario Draghi of Italy since then) and the heads of the participating national central banks.

The Maastricht Treaty entrusted the ECB with the sole goal of pursuing price stability and made it almost entirely independent of political influences. The ECB is required only to regularly brief the European Parliament on its activities, but the European Parliament has no power to influence ECB's decisions. While the U.S. Congress could pass laws reducing the independence of the Federal Reserve Board, the Maastricht Treaty itself would have to be amended by the legislatures or voters in every member country for the ECB's statute to be changed. The almost total independence of the ECB from political influence was deliberate so as to shield the ECB from being forced to provide excessive monetary stimulus, and thus lead to inflation. But this also led to the criticism that the ECB is distant and undemocratic, and not responsive to the economic needs of the citizens.

Strangely, however, the exchange rate policy of the euro is ultimately in the hands of politicians rather than of the ECB. This is puzzling because monetary and exchange rate policies are closely related, and it is impossible to conduct a truly independent policy in one without the other. Be that as it may, the EMU's first year of operation in 1999 was somewhat turbulent, with politicians demanding lower interest rates to stimulate growth and with the ECB for the most part resisting for fear of resurgent inflation. The conflict in the conduct of a unionwide monetary policy also became evident during 1999, when nations such as Ireland and Spain faced excessive growth and the danger of inflation (hence requiring a more restrictive monetary policy), while other nations (such as Germany and Italy) faced anemic growth (hence requiring lower interest rates).

As it was, the ECB adopted an intermediate monetary policy, with interest rates possibly being too low for Ireland and Spain and too high for Germany and Italy. From 2000 to 2008, the ECB conducted a fairly tight monetary policy (tighter than the one pursued by the U.S. Fed) for fear of resurgent inflation and in order to establish its credibility. Starting in fall 2008, however, the ECB slashed interest rates to fight the deep recession and economic crisis facing the Eurozone (see Case Study 20-5).

CASE STUDY 20-5 The Eurozone Crisis

Before the 2008–2009 global economic crisis ended, the Eurozone fell into a serious crisis that threatened its very existence in 2010–2011 and is still continuing, as of this writing in 2012. The crisis has affected primarily Ireland, Greece, Portugal, Spain, and Italy and has resulted from excessive and unsustainable borrowing in the face of slow growth or recession (see Table 20.4).

Excessive borrowing resulted when the borrowing costs of the weak nations fell drastically when joining the euro. But in the face of slow growth or recession in 2008–2009, it became clear that these nations would be unable to repay their loans. The collapse of Ireland, Portugal, and especially Greece was avoided only by huge bailouts or rescue packages by the richer Eurozone countries (primarily Germany) and by the European Central Bank (ECB) purchasing the government bonds of the weak nations and providing more than 800 European banks in excess of $1.3 trillion of loans for three years at 1 percent interest (which the banks immediately used to buy government bonds paying 5 to 6 percent interest). In exchange, weak nations agreed to a new stability pact that called for keeping budget deficits to no more than 0.5 percent of GDP in good or normal times (as compared with the previous Maastricht criteria of 3 percent of GDP) and reinforcing the debt ceiling criteria of 60 percent of GDP. Fiscal austerity, however, further slowed down growth or plunged weak nations into recession. The Euro crisis was really a crisis waiting to happen in view of the halfway house that the Eurozone represents, with a common monetary policy but a mostly independent fiscal policy.

Sources: D. Salvatore, "The Common Unresolved Problem of the EMS and EMU," *American Economic Review*, May 1997, pp. 224–226; and O. Issing, "The Crisis of European Monetary Union—Lessons to Be Drawn," *Journal of Policy Modeling*, September/October 2011, pp. 737–749.

(continued)

■ CASE STUDY 20-5 Continued

■ TABLE 20.4. Government Debts and Budget Deficits of Eurozone Countries in 2011

Country	Budget Deficit as Percent of GDP	Government Debt as Percent of GDP	Percentage Growth of Real GDP
Germany	1.0	87.2	3.1
Austria	2.6	79.7	3.0
Belgium	3.9	102.3	2.0
Netherlands	4.6	75.2	1.3
France	5.2	100.1	1.7
Italy	3.8	119.7	0.5
Portugal	4.2	117.6	−1.6
Spain	8.5	75.3	0.7
Greece	9.2	170.0	−6.9
Ireland	13.0	114.1	0.7

Source: Organization for Economic Cooperation and Development, *Economic Outlook* (Paris, OECD, May 2012).

20.5 Currency Boards Arrangements and Dollarization

In this section, we examine the benefits and costs of rigidly pegging or fixing the nation's exchange rate by establishing a currency board or by adopting another nation's currency (dollarization). In the next section, we then focus on the advantages and disadvantages of hybrid exchange rate systems that combine some of the characteristics of fixed and flexible exchange rates in various degrees.

20.5A Currency Board Arrangements

Currency board arrangements (CBAs) are the most extreme form of exchange rate peg (fixed exchange rate system), short of adopting a common currency or dollarizing (i.e., adopting the dollar as the nation's currency). Under CBAs, the nation rigidly fixes (often by law) the exchange rate of its currency to a foreign currency, SDR, or composite, and its central bank ceases to operate as such. CBAs are similar to the gold standard in that they require 100 percent international-reserve backing of the nation's money supply. Thus, the nation gives up control over its money supply, and its central bank abdicates its function of conducting an independent monetary policy. With a CBA, the nation's money supply increases or decreases, respectively, only in response to a balance-of-payments surplus and inflow of international reserves or to a balance-of-payments deficit and outflow of international reserves. As a result, the nation's inflation and interest rates are determined, for the most part, by conditions in the country against whose currency the nation pegged or fixed its currency.

A nation usually makes this extreme arrangement when it is in deep financial crisis and as a way to effectively combat inflation. CBAs have been in operation in several countries or economies, such as Hong Kong (since 1983), Argentina (from 1991 to the end of 2001), Estonia (from 1992 to the end of 2010), Lithuania (since 1994), Bulgaria (since 1997), and Bosnia and Herzogovina (since 1997). The key conditions for the successful operation of CBAs (besides those generally required for the successful operation of a fixed exchange rate system) are a sound banking system (since the central bank cannot be the "lender of last resort" or extend credit to banks experiencing difficulties) and a prudent fiscal policy (since the central bank cannot lend to the government).

The main advantage of CBAs is the credibility of the economic policy regime (since the nation is committed politically and often by law to stick with it), which results in lower interest rates and lower inflation in the nation. The cost of CBAs is the inability of the nation's central bank to (1) conduct its own monetary policy, (2) act as a lender of last resort, and (3) collect seignorage from independently issuing its own currency. Case Study 20-6 examines Argentina's experience with CBAs during the 1990s.

20.5B Dollarization

Some nations go even further than making CBAs by adopting another nation's currency as its own legal tender. Even though the nation can adopt the currency of any other nation, the process is usually referred to as dollarization. Besides the Commonwealth of Puerto Rico and the U.S. Virgin Islands, Panama has had full or official dollarization

CASE STUDY 20-6 Argentina's Currency Board Arrangements and Crisis

Argentina had a currency board from 1991 until the end of 2001, when it collapsed in the face of a deep economic crisis. Argentina's CBA operated reasonably well until Brazil was forced first to devalue its currency (the real) in 1999 and then allowing it to sharply depreciate. With the peso rigidly tied to the dollar, Argentina suffered a huge loss of international competitiveness vis-à-vis Brazil (its largest trade partner) and plunged into recession. But having a grossly overvalued currency was not the only reason for Argentina's economic crisis. Even more serious was its out-of-control budget deficit. Argentina was simply living beyond its possibilities and this was unsustainable. The overvaluation of the peso only made the crisis deeper. Tightening up its public finances in order to encourage foreign investments deepened the recession and led to riots in the streets without attracting new foreign investments. Foreign investors feared that Argentina would be forced to abandon its currency board and devalue the peso, which would lead to losses and possibly even restrictions on repatriation of the capital invested.

This left Argentina only two choices: devalue the peso or full dollarization. Argentina was very reluctant to abandon its CBA and devalue the peso for fear of returning to the condition of hyperinflation of the late 1980s. Dollarization was not without risks either. Specifically, while it would eliminate the foreign exchange risk and very likely attract more foreign investments, dollarization would not eliminate Argentina's international competitiveness problem, especially with respect to Brazil, nor would it solve Argentina's budget problems. As it was, in January 2002, Argentina defaulted on its huge foreign debt and was forced first to abandon its currency board and devalue the peso, and then let it float. By fall 2002, the peso had depreciated from 1 peso to the dollar under the CBA to more than 3.5 pesos per dollar (a 250 percent depreciation). Argentina eventually repaid only 25 cents on the dollar to foreign holders of its bonds.

Source: A. de la Torre, E. Yeyati, and E. Talvi, "Living and Dying with Hard Pegs: The Rise and Fall of Argentina's Currency Board," in G. von Furstenberg, V. Alexander, and J. Melitz, Eds., *Monetary Unions and Hard Pegs* (New York: Oxford University Press, 2004), pp. 183–230.

since 1904. Ecuador fully dollarized in 2000 and El Salvador in 2001. Since 2001, Nicaragua has nearly fully dollarized and Costa Rica has considered it.

The benefits and costs of dollarization are similar to those arising from adopting a CBA, only they are more pronounced because dollarization involves an even more complete renouncement of the nation's monetary sovereignty by practically giving up an "exit option" to abandon the system. The benefits of dollarization arise from the nation (1) avoiding the cost of exchanging the domestic currency for dollars and the need to hedge foreign exchange risks; (2) facing a rate of inflation similar to that of the United States as a result of commodity arbitrage, and interest rates tending to fall to the U.S. level, except for any remaining country risk (i.e., political factors that affect security and property rights in the nation); (3) avoiding foreign exchange crises and the need for foreign exchange and trade controls, fostering budgetary discipline; and (4) encouraging more rapid and full international financial integration.

Dollarization also imposes some costs on the dollarizing country: (1) the cost of replacing the domestic currency with the dollar (estimated to be about 4 to 5 percent of GDP for the average Latin American country); (2) the loss of independence of monetary and exchange rate policies (the country will face the same monetary policy of the United States, regardless of its cyclical situation); and (3) the loss of its central bank as a lender of last resort to bail out domestic banks and other financial institutions facing a crisis.

Good candidates for dollarization are small open economies for which the United States is the dominant economic partner and which have a history of poor monetary performance, and hence very little economic-policy credibility. Most of the small countries of Latin America, especially those in Central America, as well as the Caribbean nations, fit this description very well. Once we move from small to large countries, however, it becomes more difficult to come up with clear-cut answers as to whether dollarization would provide a net benefit to the nation.

20.6 Exchange Rate Bands, Adjustable Pegs, Crawling Pegs, and Managed Floating

In this section, we examine the advantages and disadvantages of hybrid exchange rate systems that combine some of the characteristics of fixed and flexible exchange rates in various degrees. These involve different exchange rate bands of fluctuation about a par value, or fixed exchange rate, adjustable peg systems, crawling pegs, and managed floating.

20.6A Exchange Rate Bands

Most fixed exchange rate systems usually allow the exchange rate to fluctuate within narrowly defined limits. That is, nations decide on the exchange rate, or par value, of their currencies and then allow a narrow band of fluctuation above and below the par value. For example, under the Bretton Woods system, which operated during the postwar period until 1971, the exchange rate was allowed to fluctuate within 1 percent above and below the established par value, or fixed exchange rate. Under the gold standard, the exchange rate, say between the dollar and the pound, could fluctuate above and below the mint parity (the so-called gold points) by the cost of transporting and insuring £1 worth of gold between New York and London (see Section 16.6A).

The actual exchange rate under a fixed exchange rate system is then determined by the forces of demand and supply within the band of fluctuation, and it is prevented from moving outside this band by official interventions in foreign exchange markets under a fixed exchange rate not tied to gold and by gold shipments under the pure gold standard (as explained in Chapter 16). In what follows, we concentrate on a fixed exchange rate system not tied to gold. The advantage of the small band of fluctuation under a fixed exchange rate system is that monetary authorities will not have to intervene constantly in foreign exchange markets to maintain the established par value, but only to prevent the exchange rate from moving outside the allowed limits of fluctuation.

The overall band of fluctuation under a fixed exchange rate system is shown in the top panel of Figure 20.5, where the par value, or fixed exchange rate between the dollar and the euro, is assumed to be $R = \$/€ = 1$ and is allowed to fluctuate within 1 percent above and below the par value (as under the Bretton Woods system). As a result, the band of fluctuation (given by the dashed horizontal lines) is defined by $R = \$0.99$ (the lower limit) and $R = \$1.01$ (the upper limit).

Thus, a fixed exchange rate system exhibits some elements of flexibility about the fixed exchange rate, or par value. Technically, nations could increase the width of the band of allowed fluctuation and let the actual exchange rate be determined more and more by market forces, thus reducing more and more the need for official intervention. Ultimately, the band of allowed fluctuation could be made so wide as to eliminate all official intervention in foreign exchange markets. This would essentially represent a flexible exchange rate system. A preference for fixed exchange rates would allow only a very narrow band of fluctuation, while a preference for flexible exchange rates would make the band very wide.

20.6B Adjustable Peg Systems

An adjustable peg system requires defining the par value and the allowed band of fluctuation, with the stipulation that the par value will be changed periodically and the currency devalued to correct a balance-of-payments deficit or revalued to correct a surplus. The Bretton Woods system (see Chapter 21) was originally set up as an adjustable peg system, with nations allowed to change the par value of their currencies when faced with a "fundamental" disequilibrium. Nowhere was fundamental disequilibrium clearly defined, but it broadly referred to a large actual or potential deficit or surplus persisting over several years.

However, under the Bretton Woods system, nations—both for national prestige reasons and for fear that frequent changes in exchange rates would encourage destabilizing speculation (and for the United States also because the dollar was held as international reserves)—were generally unwilling to change par values until practically forced to do so, often under conditions of destabilizing speculation. Thus, while the Bretton Woods system was set up as an adjustable peg system, in fact it operated more nearly as a truly fixed exchange rate system.

A truly adjustable peg system would be one under which nations with balance-of-payments disequilibria would in fact take advantage (or be required to take advantage) of the flexibility provided by the system and change their par values without waiting for the pressure for such a change to become unbearable. This is shown in the middle panel of Figure 20.5, where the original par value is the same as in the top panel, and then the nation at the beginning of the fourth month *either* devalues its currency (raises the exchange rate) if faced with a balance-of-payments deficit *or* revalues (lowers the exchange rate) if faced with a surplus.

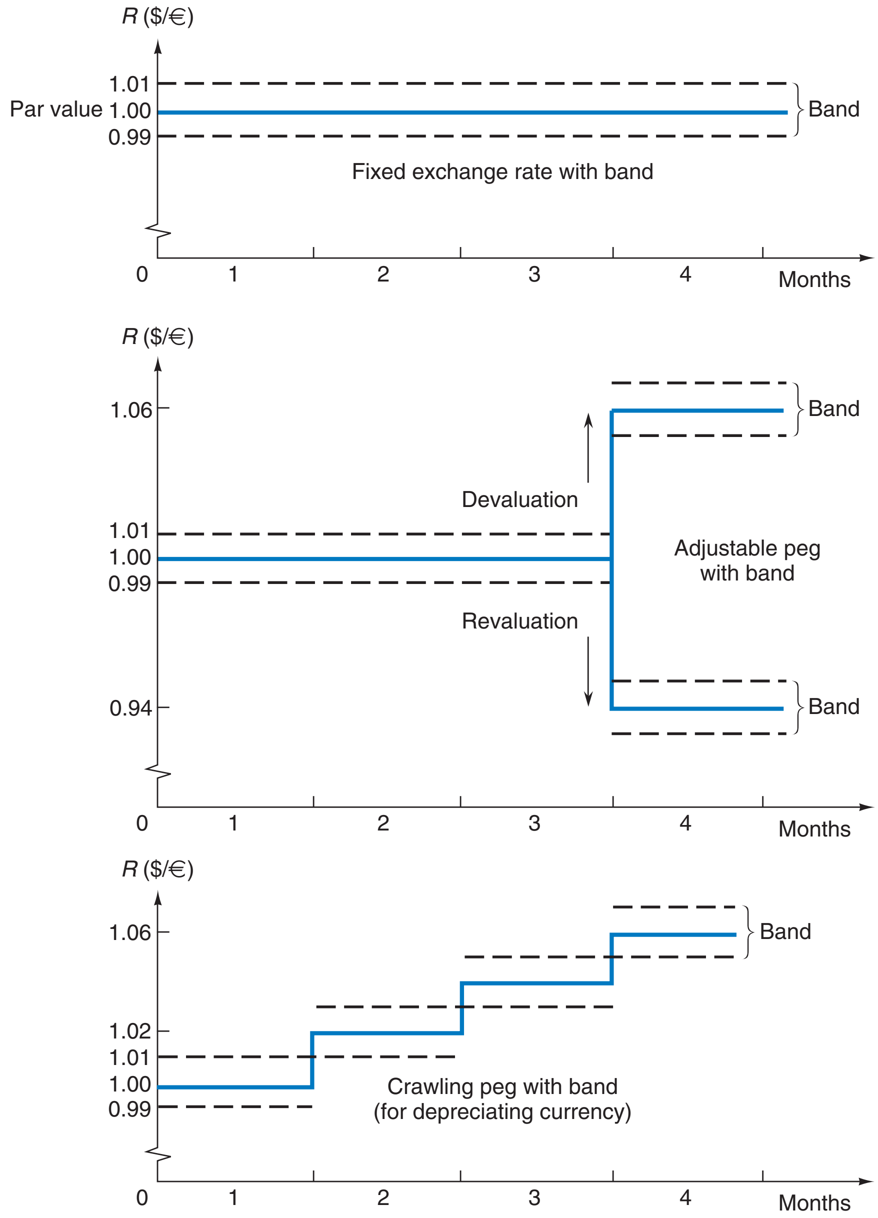

FIGURE 20.5. Exchange Rate Band, Adjustable Pegs, and Crawling Pegs.
In the top panel, the par value is $R = \$1/€1$, and the exchange rate is allowed to fluctuate by 1 percent above and below the par value established. The middle panel shows the nation devaluating its currency from $R = \$1.00$ to $R = \$1.06$ to correct a balance-of-payments deficit, or revaluing from $R = \$1.00$ to $R = \$0.94$ to correct a surplus in its balance of payments. The bottom panel shows the nation devaluing its currency by about 2 percent at the end of each of three months to correct a deficit in its balance of payments.

For an adjustable peg system to operate as intended, however, some objective rule would have to be agreed upon and enforced to determine when the nation must change its par value (such as when the international reserves of the nation fell by a certain percentage). Any such rule would to some extent be arbitrary and would also be known to speculators, who could then predict a change in the par value and profitably engage in destabilizing speculation.

20.6C Crawling Pegs

It is to avoid the disadvantage of relatively large changes in par values and possibly destabilizing speculation that the crawling peg system or system of "sliding or gliding parities" was devised. Under this system, par values are changed by small preannounced amounts or percentages at frequent and clearly specified intervals, say every month, until the equilibrium exchange rate is reached. This is illustrated in the bottom panel of Figure 20.5 for a nation requiring a devaluation of its currency. Instead of a single devaluation of 6 percent required after three months, the nation devalues by about 2 percent at the end of each of three consecutive months.

The nation could prevent destabilizing speculation by manipulating its short-term interest rate so as to neutralize any profit that would result from the scheduled change in the exchange rate. For example, an announced 2 percent devaluation of the currency would be accompanied by a 2 percent increase in the nation's short-term interest rate. However, this would interfere with the conduct of monetary policy in the nation. Nevertheless, a crawling peg system can eliminate the political stigma attached to a large devaluation and prevent destabilizing speculation. The crawling peg system can achieve even greater flexibility if it is combined with wide bands of fluctuation.

Note that if the upper limit of the band before a mini-devaluation coincides with (as in the figure) or is above the lower limit of the band after the mini-devaluation, then the devaluation may result in no change in the actual spot rate. Nations wanting to use a crawling peg must decide the frequency and amount of the changes in their par values and the width of the allowed band of fluctuation. A crawling peg seems best suited for a developing country that faces real shocks and differential inflation rates.

20.6D Managed Floating

Even if speculation were stabilizing, exchange rates would still fluctuate over time (if allowed) because of the fluctuation of real factors in the economy over the business cycle. Destabilizing speculation and overshooting would amplify these intrinsic fluctuations in exchange rates. As we have seen, exchange rate fluctuations tend to reduce the flow of international trade and investments. Under a managed floating exchange rate system, the nation's monetary authorities are entrusted with the responsibility of intervening in foreign exchange markets to smooth out these short-run fluctuations without attempting to affect the long-run trend in exchange rates. To the extent that they are successful, the nation receives most of the benefits that result from fixed exchange rates (see Section 20.4) while at the same time retaining flexibility in adjusting balance-of-payments disequilibria.

One possible difficulty is that monetary authorities may be in no better position than professional speculators, investors, and traders to know what the long-run trend in exchange rates is. Fortunately, knowledge of the long-run trend is not needed to stabilize short-run fluctuations in exchange rates if the nation adopts a policy of leaning against the wind. This requires the nation's monetary authorities to supply, out of international reserves, a portion (but not all) of any short-run excess demand for foreign exchange in the market (thus moderating the tendency of the nation's currency to depreciate) and absorb (and add to its reserves) a portion of any short-run excess supply of foreign exchange in the market (thus moderating the tendency of the nation's currency to appreciate). This reduces short-run fluctuations without affecting the long-run trend in exchange rates.

Note that under a managed float there is still a need for international reserves, whereas under a freely floating exchange rate system, balance-of-payments disequilibria are immediately and automatically corrected by exchange rate changes (with stable foreign exchange markets) without any official intervention and need for reserves. However, the freely floating exchange rate system will experience exchange rate fluctuations that the managed float attempts to moderate.

What proportion of the short-run fluctuation in exchange rates monetary authorities succeed in moderating under a managed floating system depends on what proportion of the short-run excess demand for or supply of foreign exchange they absorb. This, in turn, depends on their willingness to intervene in foreign exchange markets for stabilization purposes and on the size of the nation's international reserves. The larger the nation's stock of international reserves, the greater is the exchange rate stabilization that it can achieve.

There is, however, the danger that if the rules of leaning against the wind discussed earlier are not spelled out precisely (as has been the case since 1973), a nation might be tempted to keep the exchange rate high (i.e., its currency at a depreciated level) to stimulate its exports (this has been precisely the U.S. situation with China since 2005). This is a disguised beggar-thy-neighbor policy and invites retaliation by other nations when they face an increase in their imports and a reduction in their exports. This type of floating is sometimes referred to as dirty floating. Thus, in the absence of clearly defined and adhered-to rules of behavior, there exists the danger of distortions and conflicts that can be detrimental to the smooth flow of international trade and investments.

The world has had a floating exchange rate system of sorts since 1973. To be sure, this system was not deliberately chosen but was imposed by the collapse of the Bretton Woods system under chaotic conditions in foreign exchange markets and unbearable destabilizing speculation. In the early days of the managed floating system, serious attempts were made to devise specific rules for managing the float to prevent dirty floating and the inevitable conflicts that would follow. However, all of these attempts have failed. What is true is that neither the best expectations of those who favored flexible rates in the early 1970s, nor the worst fears of those who opposed flexible rates, have in fact materialized over the past four decades of the managed float. What is also probably true is that no fixed exchange rate system would have survived the great turmoil of the 1970s arising from the sharp increase in petroleum prices and consequent worldwide inflation and recession.

Nevertheless, the large appreciation of the U.S. dollar from 1980 until February 1985 and the equally large depreciation from February 1985 to the end of 1987 clearly indicate that large exchange rate disequilibria can arise and persist over several years under the present managed floating exchange rate system. This has renewed calls for reform of the present international monetary system along the lines of establishing target zones of allowed fluctuations for the leading currencies and for more international cooperation and coordination of policies among the leading nations.

The present system thus exhibits a large degree of flexibility and more or less allows each nation to choose the exchange rate regime that best suits its preferences and circumstances (see Case Study 20-7). In general, large industrial nations and nations suffering

CASE STUDY 20-7 Exchange Rate Arrangements of IMF Members

Table 20.5 gives the distribution of actual (de facto) exchange rate arrangements of the 187 member countries of the International Monetary Fund and three territories: Aruba (Netherlands), Curacao and Saint Maarten (Netherlands), and Hong Kong SAR (China) as of April 30, 2011. The table shows 107 countries (56.4 percent of the total of 190 countries and territories) operated under hard or soft pegged (i.e., some kind of fixed exchange rate system) and 83 countries (43.6 percent of the total) operated with floating or other managed arrangements.

Among the 13 countries with no separate legal tender (hard peg) were Ecuador, El Salvador, and Panama (all three using the dollar); among the 12 countries that have a currency board (also a hard peg) are Bulgaria, Hong Kong SAR, and Lithuania; the 43 countries that have a conventional (soft) peg include Denmark, Jordan, Kuwait, Libya, Morocco, Saudi Arabia, and Venezuela; the 23 countries that have stabilized arrangements (also a soft peg) include Iran, Pakistan, Syria, and the Ukraine; and among the 12 countries with a crawl-like arrangement (also a soft peg) are Argentina, Bangladesh, China, Dominican Republic, and Egypt.

Among the 36 countries that operate under floating are Brazil, Hungary, India, Indonesia, Korea, Mexico, Philippines, Romania, South Africa, Thailand, and Turkey; the 30 countries that operate under free floating include the United States, the 17 members of the European Monetary Union (EMU) or Eurozone, Japan, the United Kingdom, Australia, Canada, Chile, Poland, and Sweden. Thus, we see that there were a wide variety of exchange rate arrangements in existence at the end of April 2011.

TABLE 20.5. Exchange Rate Arrangements of IMF Members as of April 30, 2011

Exchange Rate Arrangements	Number of Countries	Percent
Hard Pegs	**25**	**13.2**
No separate legal tender	13	6.8
Currency board	12	6.3
Soft Pegs	**82**	**43.2**
Conventional peg	43	22.6
Stabilized arrangement	23	12.1
Crawling peg	3	1.6
Crawl-like arrangement	12	6.3
Pegged exchange rate within horizontal bands	1	0.5
Floating	**66**	**34.7**
Floating	36	18.9
Free floating	30	15.8
Residual		
Other managed arrangements	**17**	**8.9**
Total	**190**	**100.0**

Source: International Monetary Fund, *Annual Report on Exchange Rate Arrangements and Exchange Rate Restrictions 2011* (Washington, D.C.: 2011).

from greater inflationary pressures than the rest of the world have opted for greater exchange rate flexibility than smaller developing nations or highly specialized open economies. Under the 1976 Jamaica Accords (which more or less formally recognized the de facto managed floating system in operation since 1973), a nation may change its exchange rate regime as conditions change, as long as this does not prove disruptive to trade partners and the world economy. (More will be said on this in Chapter 21.) In recent years a near consensus seems to be emerging that nations should only consider and choose between rigidly fixed exchange rates or fairly flexible ones. Intermediate systems are considered less attractive because they are more likely to lead to destabilizing speculation and thus become more easily unsustainable.

20.7 International Macroeconomic Policy Coordination

During recent decades, the world has become much more integrated, and industrial countries have become increasingly interdependent. International trade has grown twice as fast as world output, and the international mobility of financial capital has increased even faster, especially since the early 1970s. Today, the ratio of international trade to GNP in the seven largest industrialized (i.e., G-7) countries is twice as large as in 1960, and the world is rapidly moving toward truly integrated and global international capital markets.

The increased interdependence in the world economy today has sharply reduced the effectiveness of national economic policies and increased their spillover effects on the rest of the world. For example, an easy monetary policy to stimulate the U.S. economy will reduce interest rates in the United States and lead to capital outflows. This undermines some of the expansionary effect of the easy monetary policy in the United States and results in a dollar depreciation (other things being equal). Other nations face a capital inflow and appreciation of their currencies as the direct result of monetary expansion in the United States, and this may undermine their ability to achieve their own specific national objectives. Similarly, an expansionary fiscal policy in the United States will have important spillover effects on the rest of the world (refer to Case Studies 17-6, 18-3, and 18-4).

With increased interdependence, international macroeconomic policy coordination becomes more desirable and essential. Specifically, nations can do better by setting policies cooperatively than by each acting independently. International macroeconomic policy coordination thus refers to the modifications of national economic policies in recognition of international interdependence. For example, with a worldwide recession, each nation may hesitate to stimulate its economy to avoid a deterioration of its trade balance. Through a coordinated simultaneous expansion of all nations, however, output and employment can increase in all nations without any of them suffering a deterioration in their trade balances. Similarly, international policy coordination can avoid competitive devaluations by nations in order to stimulate their exports (beggar-thy-neighbor policies). Competitive devaluations are very likely to lead to retaliation and are self-defeating, and disrupt international trade. This is in fact what occurred during the interwar period (i.e., in the years between World War I and World War II) and was one of the reasons for the establishment of a fixed exchange rate system (the Bretton Woods system) after World War II. This can be regarded as a cooperative agreement to avoid competitive devaluations.

International policy coordination under the present international monetary system has occurred only occasionally and has been limited in scope. One such episode was in 1978 when Germany agreed to serve as "locomotive" for the system (i.e., to stimulate its economy, thereby increasing its imports and thus stimulating the rest of the world). Fearing a resurgence of domestic inflation, however, Germany abandoned its effort before it bore fruit. A more successful episode of limited international policy coordination was the Plaza Agreement of September 1985, under which the G-5 countries (the United States, Japan, Germany, France, and the United Kingdom) agreed to jointly intervene in foreign exchange markets to induce a gradual depreciation or "soft landing" of the dollar in order to eliminate its large overvaluation. A related example of successful but limited international policy coordination was the Louvre Accord in February 1987, which established soft reference ranges or target zones for the dollar-yen and dollar-mark exchange rates. Other examples of successful but limited policy coordination are given by the series of coordinated interest rate cuts engineered by the United States, Japan, and Germany in 1986 and their quick coordinated response to the October 1987 worldwide equity-market crash. There was also some coordinated response after the September 11, 2001, terrorist attacks on the United States and during the 2008–2009 world economic recession.

The above instances of policy coordination were sporadic and limited in scope, however. The coordination process seems also to have deteriorated since 1989. For example, in December 1991, Germany sharply increased interest rates to their highest level since 1948 in order to stem inflationary pressures fueled by the rebuilding of East Germany, in spite of the fact that the United States and the rest of Europe were in or near recession and therefore would have preferred lower interest rates. The United States did in fact lower its interest rate to pull out of its recession, and this led to a sharp depreciation of the dollar vis-à-vis the German mark. The other countries of the EU were instead forced to follow the German lead and raise interest rates in order to keep their exchange rates within the allowed 2.25 percent band of fluctuation, as required by the European Monetary System, and thus had to forgo easy monetary policy to stimulate their weak economies. This total German disregard for the requirements of other leading nations was a serious setback for international monetary cooperation and coordination and led to the serious crisis of the ERM in September 1992 and August 1993 (refer to Section 20.4B).

There are several obstacles to successful and effective international macroeconomic policy coordination. One is the lack of consensus about the functioning of the international monetary system. For example, the U.S. Fed may believe that a monetary expansion would lead to an expansion of output and employment, while the European Central Bank may believe that it will result in inflation. Another obstacle arises from the lack of agreement on the precise policy mix required. For example, different macroeconometric models give widely different results as to the effect of a given fiscal expansion. There is then the problem of how to distribute the gains from successful policy coordination among the participants and how to spread the cost of negotiating and policing agreements. Empirical research reported in *Frenkel*, *Goldstein, and Masson* (1991) indicates that nations gain from international policy coordination about three-quarters of the time but that the welfare gains from coordination, when they occur, are not very large. These empirical studies, however, may not have captured the full benefits from successful international policy coordination.

SUMMARY

1. While we earlier examined separately the process of adjustment under flexible and fixed exchange rate systems, in this chapter we evaluated and compared the advantages and disadvantages of a flexible as opposed to a fixed exchange rate system, as well as the merits and drawbacks of hybrid systems combining various characteristics of flexible and fixed exchange rates.

2. The case for a flexible exchange rate system rests on its alleged greater market efficiency and its policy advantages. A flexible exchange rate system is said to be more efficient than a fixed exchange rate system because (1) it relies only on changes in exchange rates, rather than on changing all internal prices, to bring about balance-of-payments adjustment; (2) it makes adjustment smooth and continuous rather than occasional and large; and (3) it clearly identifies the nation's degree of comparative advantage and disadvantage in various commodities. The policy advantages of a flexible exchange rate system are (1) it frees monetary policy for domestic goals; (2) it enhances the effectiveness of monetary policy; (3) it allows each nation to pursue its own inflation–unemployment trade-off; (4) it removes the danger that the government will use the exchange rate to reach goals that can be better achieved by other policies; and (5) it eliminates the cost of official interventions in foreign exchange markets.

3. The case for a fixed exchange rate system rests on the alleged lower uncertainty, on the belief that speculation is more likely to be stabilizing, and on fixed rates being less inflationary. However, on both theoretical and empirical grounds, it seems that a flexible exchange rate system does not compare unfavorably with a fixed exchange rate system as far as the type of speculation to which it gives rise. On the other hand, flexible exchange rates are generally more efficient and do give nations more flexibility in pursuing their own stabilization policies, but they are generally more inflationary than fixed exchange rates and less stabilizing and suited for nations facing large internal shocks. They also seem to lead to excessive exchange rate volatility. Be that as it may, policymakers face an open-economy policy trilemma.

4. An *optimum currency area or bloc* refers to a group of nations whose national currencies are linked through permanently fixed exchange rates. This offers important advantages but also leads to some costs for the participating nations. The European Monetary System (EMS) was started in 1979 and involved creating the European Currency Unit (ECU), keeping exchange rates of member countries fluctuating within a 2.25 percent band, and establishing the European Monetary Cooperation Fund (EMCF) to provide members with short- and medium-term balance-of-payments assistance. In June 1989, a committee headed by Jacques Delors, the president of the European Commission, recommended a three-stage transition to the goal of monetary union, with a single currency and a European Central Bank (ECB) by 1997 or 1999. In September 1992, the United Kingdom and Italy dropped out of the exchange rate mechanism and the band of allowed fluctuation was increased to ± 15 percent. On January 1, 1999, 11 of the then 15 members of the European Union (EU) formed the European Monetary Union (EMU) with the adoption of the euro as their common currency and with the European Central Bank (ECB) responsible for unionwide monetary policy in the eurozone. By 2011, 17 EU nations had adopted the euro.

5. Under currency board arrangements (CBAs), the nation rigidly fixes the exchange rate and its central bank loses control over the nation's money supply or its ability to conduct an independent monetary policy or be the lender of last resort. With a CBA the nation's money supply increases or decreases, respectively, only in response to a balance-of-payments surplus or to a balance-of-payments deficit. The main advantage of CBAs is the credibility of the economic policy regime and lower interest rates and inflation. Dollarization refers to a nation adopting the currency of another nation (most often the dollar) as its legal tender. The benefits and costs of dollarization are similar to those arising from adopting a CBA, only they are more pronounced because the nation gives up its "exit option."

6. Most exchange rate systems usually allow the exchange rate to fluctuate within narrowly defined limits. An adjustable peg system would require nations periodically to change their exchange rates when in balance-of-payments disequilibrium. The disadvantage of an adjustable peg system is that it may lead to destabilizing speculation. This can be overcome by a crawling peg system wherein par values are changed by small amounts at frequent specified intervals. Half of the 185 members of the International Monetary Fund operated under a fixed exchange rate system of some type, while the other half had some exchange rate flexibility in 2011.

7. During recent decades, the world has become increasingly interdependent. This has made international policy coordination more desirable and essential. International policy coordination under the present international monetary system has occurred only occasionally and has been limited in scope. The obstacles arise because of the lack of consensus about the functioning of the international monetary system, lack of agreement on the precise policy mix required, and difficulty in agreeing on how to distribute the gains from successful policy coordination among the participants and how to spread the cost of negotiating and policing agreements. Empirical research indicates that the welfare gains from coordination, when they occur, are not very large.

A LOOK AHEAD

In Chapter 21 (the last chapter in the book), we examine the operation of the international monetary system from the gold standard period to the present. Fragments of this experience were presented as examples as the various mechanisms of balance-of-payments adjustment were examined in previous chapters. However, in Chapter 21, we will bring it all together and evaluate the process of balance-of-payments adjustment as it actually occurred under the various international monetary systems that existed from 1880 through 2011. We also indicate how the international economic problems facing the world today, which were identified in Chapter 1, might be solved.

KEY TERMS

Adjustable peg system, p. 668
Crawling peg system, p. 670
Currency board arrangements (CBAs), p. 665
Dirty floating, p. 671
Dollarization, p. 666
Euro, p. 660
European Central Bank (ECB), p. 663
European Currency Unit (ECU), p. 657
European Monetary Cooperation Fund (EMCF), p. 657
European Monetary Institute (EMI), p. 659
European Monetary System (EMS), p. 657
European Monetary Union (EMU), p. 660
Exchange Rate Mechanism (ERM), p. 658
Freely floating exchange rate system, p. 648
International macroeconomic policy coordination, p. 673
Leaning against the wind, p. 670
Maastricht Treaty, p. 659
Managed floating exchange rate system, p. 670
Optimum currency area or bloc, p. 656
Stability and Growth Pact (SGP), p. 659
Trilemma, p. 654

QUESTIONS FOR REVIEW

1. How does a flexible exchange rate system in general adjust balance-of-payments disequilibria? How does a fixed exchange rate system in general adjust balance-of-payments disequilibria? Why is the choice between these two basic types of adjustment systems important?

2. What are the two main types of advantage of a flexible as opposed to a fixed exchange rate system? What are the specific advantages subsumed under each main type of advantage of a flexible exchange rate system?

3. What are the alleged advantages of a fixed over a flexible exchange rate system? How would the advocates of flexible exchange rates reply?

4. On the basis of the theoretical and empirical evidence available, indicate what overall conclusion can be reached on whether a flexible or a fixed exchange rate system is preferred.

5. What is meant by an optimum currency area or bloc?

6. What are the main advantages and disadvantages of an optimum currency area? What are the conditions required for the establishment of an optimum currency area?

7. What is meant by the European Monetary System? How has it functioned since its establishment? What is the European Monetary Union? the euro? What is the function of the European Central Bank?

8. What is meant by currency board arrangements? dollarization? Why would a nation adopt one or the other? How does each operate? What are the benefits and costs of each?

9. What is the effect of increasing the allowed band of exchange rate fluctuation under a fixed exchange rate system?

10. What is meant by an adjustable peg system? What are the advantages and disadvantages of an adjustable peg system with respect to a system of permanently fixed exchange rates?

11. What is meant by a crawling peg system? How can such a system overcome the disadvantage of an adjustable peg system?

12. What is meant by a managed floating exchange rate system? How does the policy of leaning against the wind operate? What is the advantage of a managed floating system with respect to a freely floating exchange rate system and a fixed exchange rate system?

13. What is meant by dirty floating? How well is the present managed floating system operating?

14. What is meant by international macroeconomic policy coordination? Why is it needed? How does it operate?

15. How large are the potential benefits from greater macroeconomic policy coordination? How likely is it that we will see much greater macroeconomic policy coordination among the leading industrial nations in the foreseeable future?

PROBLEMS

***1.** Suppose that the price of a commodity is \$3.50 in the United States and €4 in the European Monetary Union and the actual exchange rate between the dollar and the euro is $R = \$1/€1$, but, the equilibrium exchange rate $R' = \$0.75/€1$.

(a) Will the United States import or export this commodity?

(b) Does the United States have a comparative advantage in this commodity?

***2.** Explain why monetary policy would be completely ineffective under a fixed exchange rate system and perfectly elastic international capital flows.

3. Draw a figure similar to Figure 20.1, but showing that for given shifts in the nation's supply curve of foreign exchange, the exchange rate would fluctuate less when the demand for foreign exchange is elastic than when it is inelastic.

4. Draw a figure similar to Figure 20.2 showing the fluctuation in the exchange rate over the business cycle without speculation, with stabilizing speculation, and with destabilizing speculation when there is no long-run trend in the exchange rate over the cycle.

5. Do the same as in Problem 4 but assuming an implicit appreciating trend of the dollar over the business cycle.

***6.** Explain the difference between an optimum currency area and a fixed exchange rate system.

*= Answer provided at www.wiley.com/college/salvatore.

7. Explain why (a) a single central bank and currency for the countries of the European Union mean that its members can no longer have an independent monetary policy and (b) there is no such thing as an exchange rate among member nations.

8. Indicate the benefits and costs that are likely to arise for the EU member countries from the establishment of a single currency.

9. Indicate the difference among

(a) a fixed exchange rate system,

(b) a currency board arrangement, and

(c) dollarization.

10. Starting with the exchange rate of $R = \$2/€1$, draw a figure showing the exchange rate under a crawling peg system with the nation appreciating its currency by 1 percent at the end of each month for three months, with an allowed band of fluctuation of 1 percent above and below the par value.

11. Starting with the solid line (curve *A*) showing the fluctuation in the exchange rate over the business cycle in the absence of speculation in Figure 20.2, draw a figure showing the fluctuation in the exchange rate over the cycle (under a managed floating exchange rate system and no speculation) with a policy of leaning against the wind that eliminates about one-half of the fluctuation in the exchange rate.

12. A flexible exchange rate system will insulate the economy from international disturbance and therefore eliminate the need for international policy coordination. True or false? Explain.

13. Explain how game theory can be used to examine international macroeconomic policy coordination.

14. Explain why each nation might pursue a loose fiscal policy and a tight monetary policy in the absence of international policy coordination but the opposite with policy coordination.

15. **(a)** Review the experience with international macroeconomic policy coordination among the leading industrial countries during the past two decades.

(b) What conclusion can you reach regarding the possibility of much greater international macroeconomic policy coordination among the leading industrial countries of the world today?

APPENDIX

A20.1 Exchange Rate Arrangements

In this appendix, we present the exchange rate arrangements, as of April 30, 2011, of the 187 countries and three territories that are members of the International Monetary Fund. This is shown in Table 20.6 on the following three pages. The table shows that the present system exhibits a large degree of freedom for each nation to choose the exchange regime that best suits it. As a result, some have referred to the present system as a nonsystem. A nation may also change its exchange regime as long as the change is not disruptive to its trade partners and to the world economy.

Problem What kind of exchange rate arrangement did the nations of the European Union adopt on January 1, 1999?

TABLE 20.6. De Facto Classification of Exchange Rate Arrangements and Monetary Policy Framework, April 30, 2011

Exchange Rate arrangement (number of countries)	Monetary Policy Framework								
	Exchange Rate Anchor						Monetary aggregate target (29)	Inflation-targeting framework (31)	Other[1] (33)
	U.S. dollar (48)		Euro (27)		Composite (14)	Other (8)			
No separate legal tender (13)	Ecuador El Salvador Marshall Islands Micronesia, Fed. States of	Palau Panama Timor-Leste Zimbabwe (01/10)	Kosovo Montenegro	San Marino		Kiribati Tuvalu			
Currency board (12)	ECCU Antigua and Barbuda Dominica Grenada St. Kitts and Nevis St. Lucia	St. Vincent and the Grenadines Djibouti Hong Kong SAR	Bosnia and Herzegovina Bulgaria	Lithuania[2]		Brunei Darussalam			
Conventional peg (43)	Aruba Bahamas, The Bahrain Barbados Belize Curaçao and Sint Maarten Eritrea	Jordan Oman Qatar Saudi Arabia Turkmenistan United Arab Emirates Venezuela	Cape Verde Comoros Denmark[2] Latvia[2] São Tomé and Príncipe (01/10) WAEMU Benin Burkina Faso Côte d'Ivoire Guinea-Bissau Mali Niger	Senegal Togo CAEMC Cameroon Central African Rep. Chad Congo, Rep. of Equatorial Guinea Gabon	Fiji, Rep. of Kuwait Libya Morocco[3] Samoa	Bhutan Lesotho Namibia Nepal Swaziland			

(continued)

TABLE 20.6. Continued

Exchange Rate arrangement (number of countries)	Monetary Policy Framework: Exchange Rate Anchor: U.S. dollar (48)		Euro (27)	Composite (14)	Other (8)	Monetary aggregate target (29)	Inflation-targeting framework (31)	Other[1] (33)
Stabilized arrangement (23)	Cambodia Guyana Honduras Iraq Jamaica Lao Peoples Dem. Rep. Lebanon	Malawi[4] (02/10) Maldives (04/11) Suriname Trinidad and Tobago Vietnam	Macedonia	Belarus (05/10) Iran, Islamic Rep. of Syrian Arab Rep. Tunisia		Burundi[5] Pakistan[5] (06/10) Tajikistan[5] Ukraine[4, 5] (03/10)		Azerbaijan[5] Bolivia[5]
Crawling peg (3)	Nicaragua			Botswana		Uzbekistan[5]		
Crawl-like arrangement (12)	Ethiopia Kazakhstan		Croatia (06/10)			Argentina[4,5] (01/10) Bangladesh[5] (10/10) Congo, Dem. Rep. of[5] (05/10) China[5] (06/10) Dominican Rep.[4,5] (02/10) Rwanda[4,5] (01/10) Sri Lanka[4,5] (03/10)		Egypt[4,6] (03/09) Haiti[4,5] (03/10)

Pegged exchange rate within horizontal bands (1)		Tonga			
Other managed arrangement (17)	Angola Liberia Sudan[4] (12/09)	Algeria Singapore Vanuatu	Guinea Nigeria Paraguay Solomon Islands (02/11) Yemen, Rep. of		Costa Rica Kyrgyz Rep. Malaysia Mauritania Myanmar Russian Federation
Floating (36)			Afghanistan, Islamic Rep. of (04/11) Gambia, The Kenya Madagascar Mongolia Mozambique Papua New Guinea Seychelles Sierra Leone Tanzania Uganda Zambia	Albania Armenia[6] Brazil Colombia Georgia[4,7] (01/10) Ghana Guatemala Hungary Iceland Indonesia (02/11) Israel Korea, Rep. of Mexico Moldova Peru (04/11) Philippines Romania Serbia South Africa Thailand Turkey (10/10) Uruguay	India Mauritius (07/10)

(continued)

■ TABLE 20.6. Continued

Exchange Rate arrangement (number of countries)	Monetary Policy Framework						
	Exchange Rate Anchor				Monetary aggregate target	Inflation-targeting framework	Other[1]
	U.S. dollar (48)	Euro (27)	Composite (14)	Other (8)	(29)	(31)	(33)
Free floating (30)						Australia	Japan
						Canada	Somalia
						Chile	Switzerland (06/10)
						Czech Rep.	United States
						New Zealand	EMU
						Norway	Austria
						Poland	Belgium
						Sweden	Cyprus
						United Kingdom	Estonia (01/11)
							Finland
							France
							Germany
							Greece
							Ireland
							Italy
							Luxembourg
							Malta
							Netherlands
							Portugal
							Slovak Republic
							Slovenia
							Spain

Note: If the member country's de facto exchange rate arrangement has been reclassified during the reporting period, the date of change is indicated in parentheses.

[1]Includes countries that have no explicitly stated nominal anchor, but rather monitor various indicators in conducting monetary policy.

[2]The member participates in the European Exchange Rate Mechanism (ERM II).

[3]Within the framework of an exchange rate fixed to a currency composite, the Bank Al-Maghrib (BAM) adopted a monetary policy framework in 2006 based on various inflation indicators with the overnight interest rate as its operational target to pursue its main objective of price stability. Since March 2009, the BAM reference interest rate has been set at 3.25%.

[4]The exchange rate arrangement was reclassified retroactively, overriding a previously published classification.

[5]The de facto monetary policy framework is an exchange rate anchor to the U.S. dollar.

[6]The de facto monetary policy framework is an exchange rate anchor to a composite.

[7]The central bank has taken preliminary steps toward inflation targeting and is preparing for the transition to full-fledged inflation targeting.

Source: IMF staff.

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INTERNet

The International Monetary Fund (IMF), the Organization for Economic Cooperation and Development (OECD), and the Bank for International Settlements (BIS) regularly review the monetary, fiscal, and exchange rate policies of various nations and other economic units and post many of their results on their web sites, which are:

http://www.imf.org

http://www.oecd.org

http://www.bis.org

The central banks of the leading nations (the Board of Governors of the Federal Reserve Bank and the Federal Reserve Bank of New York for the United States and the European Central Bank for the European Monetary Union) include on their web sites a great deal of information on national economic and financial policies. The web sites for the United States, the European Union, the Bank of England, the Bank of Japan, and the Bank of Canada are:

http://www.federalreserve.gov/policy.htm

http://www.newyorkfed.org/index.html

http://www.ecb.int

http://www.bankofengland.co.uk

http://www.boj.or.jp/en/index.htm

http://www.bankofcanada.ca/en/index.html

The link to most of the worlds' central banks is found on the web site of the Bank for International Settlements (BIS) at:

http://www.bis.org/cbanks.htm

Analyses of monetary and other economic policies of the leading nations are also provided in *The Economic Report of the President*, The Federal Reserve Bank of St. Louis, the European Commission (EC), National Bureau of Economic Research (NBER), and Institute for International Economics (IIE). The web sites for these organizations are:

http://www.gpoaccess.gov/eop

http://www.stls.frb.org

http://europa.eu

http://nber.org

http://www.iie.com

chapter 21

The International Monetary System: Past, Present, and Future

LEARNING GOALS:

After reading this chapter, you should be able to:

- Understand how the gold standard operated
- Describe how the postwar Bretton Woods System operated and why it collapsed
- Know how the present international monetary system works
- Identify the major international economic problems facing the world today

21.1 Introduction

In this chapter, we examine the operation of the international monetary system from the gold standard period to the present. Fragments of this experience were presented as examples when the various mechanisms of balance-of-payments adjustment were examined. We now bring it all together and evaluate the process of balance-of-payments adjustment and, more broadly, open-economy macroeconomic policies and performance as they actually occurred under the various international monetary systems that existed from 1880 to the present. Although the approach is historical, the evaluation of the operation of the various international monetary systems will be conducted in terms of the analytical framework developed in Chapters 16 through 20.

An international monetary system (sometimes referred to as an international monetary *order* or *regime*) refers to the rules, customs, instruments, facilities, and organizations for effecting international payments. International monetary systems can be classified according to the way in which exchange rates are determined or according to the form that international reserve assets take. Under the exchange rate classification, we can have a fixed exchange rate system with a narrow band of fluctuation about a par value, a fixed exchange rate system with a wide band of fluctuation, an adjustable peg system, a crawling peg system, a managed floating exchange rate system, or a freely floating exchange rate system. Under the international reserve classification, we can have a gold standard (with gold as the only international reserve asset), a pure fiduciary standard (such as a pure dollar or exchange standard without any connection with gold), or a gold-exchange standard (a combination of the previous two).

The various classifications can be combined in various ways. For example, the gold standard is a fixed exchange rate system. However, we can also have a fixed exchange rate system without any connection with gold, but with international reserves comprised of some national currency, such as the U.S. dollar, that is no longer backed by gold. Similarly, we can have an adjustable peg system or a managed float with gold and foreign exchange or with only foreign exchange as international reserves. Under a freely floating exchange rate system, there is theoretically no need for reserves since exchange rate changes automatically and immediately correct any balance-of-payments disequilibrium as it develops. Throughout the period of our analysis, most of the international monetary systems possible were in operation at one time or another or for some nations, as described in this chapter.

A good international monetary system is one that maximizes the flow of international trade and investments and leads to an "equitable" distribution of the gains from trade among the nations of the world. An international monetary system can be evaluated in terms of adjustment, liquidity, and confidence. Adjustment refers to the process by which balance-of-payments disequilibria are corrected. A good international monetary system is one that minimizes the cost of and the time required for adjustment. Liquidity refers to the amount of international reserve assets available to settle temporary balance-of-payments disequilibria. A good international monetary system is one that provides adequate international reserves so that nations can correct balance-of-payments deficits without deflating their own economies or being inflationary for the world as a whole. Confidence refers to the knowledge that the adjustment mechanism is working adequately and that international reserves will retain their absolute and relative values.

In Section 21.2, we examine the gold standard as it operated from about 1880 to 1914 and the experience between World War I and World War II. The gold standard was a fixed exchange rate system with gold as the only international reserve asset. The interwar period was characterized first by a system of flexible exchange rates and subsequently by the attempt to reestablish the gold standard—an attempt doomed to failure. Sections 21.3, 21.4, and 21.5 examine the establishment, operation, and collapse of the Bretton Woods system, the fixed or adjustable peg gold-exchange standard that operated from the end of World War II until August 1971. From then through March 1973, an adjustable peg dollar standard prevailed. Section 21.6 examines the operation of and the problems facing the present managed floating exchange rate system. Finally, the appendix presents the composition and value of international reserves from 1950 to 2011.

21.2 The Gold Standard and the Interwar Experience

In this section, we examine first the gold standard as it operated from about 1880 to the outbreak of World War I in 1914. Then we examine the interwar experience with flexible exchange rates between 1919 and 1924 and the subsequent attempt to reestablish the gold standard. (This attempt failed with the deepening of the Great Depression in 1931.)

21.2A The Gold Standard Period (1880–1914)

The *gold standard* operated from about 1880 to 1914. Under this standard, as explained in Section 16.6A, each nation defined the gold content of its currency and passively stood ready to buy or sell any amount of gold at that price. Since the gold content in one unit of each currency was fixed, exchange rates were also fixed. This was called the *mint parity*. The exchange rate could then fluctuate above and below the mint parity (i.e., within the *gold points*) by the cost of shipping an amount of gold equal to one unit of the foreign currency between the two monetary centers.

The exchange rate was determined within the gold points by the forces of demand and supply and was prevented from moving outside the gold points by gold shipments. That is, the tendency of a currency to depreciate past the *gold export point* was halted by gold outflows from the nation. These gold outflows represented the deficit in the nation's balance of payments. Conversely, the tendency of a nation's currency to appreciate past the *gold import point* was halted by gold inflows. These gold inflows measured the surplus in the nation's balance of payments. Since deficits were supposed to be settled in gold and nations had limited gold reserves, deficits could not go on forever but had to be corrected quickly.

The adjustment mechanism under the gold standard, as explained by *Hume*, was the automatic *price-specie-flow mechanism* (see Section 16.6B), which operated as follows. Since each nation's money supply consisted of either gold itself or paper currency backed by gold, the money supply would fall in the deficit nation and rise in the surplus nation. This would cause internal prices to fall in the deficit nation and rise in the surplus nation (the *quantity theory of money*). As a result, the exports of the deficit nation would be encouraged and its imports discouraged until its balance-of-payments deficit was eliminated. The opposite would occur in the surplus nation.

Passively allowing its money supply to change for balance-of-payments considerations meant that a nation could not use monetary policy for achieving full employment without inflation. But this created no difficulties for classical economists, since they believed that there was an automatic tendency in the economic system toward full employment without inflation.

For the adjustment process to operate, nations were not supposed to *sterilize* (i.e., neutralize) the effect of a balance-of-payments deficit or surplus on the nation's money supply. On the contrary, the *rules of the game* of the gold standard required a deficit nation to reinforce the adjustment process by further restricting credit and a surplus nation to further expand credit. However, *Nurkse and Bloomfield* found that monetary authorities often did not follow the rules of the game during the period of the gold standard but sterilized part, though not all, of the effect of a balance-of-payments disequilibrium on the nation's money supply. *Michaely* argued that this was necessary to moderate the adjustment process and prevent an excessive reduction in the deficit nation's money supply and an excessive increase in the surplus nation's money supply.

This is how the adjustment mechanism was supposed to have worked under the gold standard. In reality, *Taussig* and some of his students at Harvard found in the 1920s that the adjustment process seemed to work much too quickly and smoothly and with little, if any, actual transfers of gold among nations. Taussig found that balance-of-payments disequilibria were settled mostly by international capital flows rather than through gold shipments (as described above). That is, when the United Kingdom had a balance-of-payments deficit, its money supply fell, interest rates rose, and this attracted a short-term capital inflow to cover the deficit.

The United Kingdom reinforced this incentive for capital inflows by deliberately raising its discount rate (called the *bank rate* then), which increased interest rates and capital inflows even more. Furthermore, the reduction in the U.K. money supply as a result of a deficit seems to have reduced domestic economic activity more than prices, and this discouraged imports (as described by the automatic *income* adjustment mechanism discussed in Chapter 17). The opposite process corrected a surplus in the U.K. balance of payments.

Not only did most of the adjustment under the gold standard not take place as described by the price-specie-flow mechanism, but if the adjustment process was quick and smooth, this was due to the special conditions that existed during the period of the gold standard. This was a period of great economic expansion and stability throughout most of the world. The pound sterling was the only important international currency and London the only international monetary center. Therefore, there could be no lack of confidence in the pound and shifts into other currencies and to other rival monetary centers. There was greater price flexibility than today, and nations subordinated internal to external balance. Under such circumstances, any international monetary system would probably have worked fairly smoothly.

Reestablishing the gold standard today without at the same time recreating the conditions that ensured its smooth operation during the 30 years or so before World War I would certainly lead to its collapse. Nevertheless, the period of the gold standard is surrounded by an aura of nostalgia about “the good old days” that is difficult to dispel and that to some extent lingers on even today. However, it is improbable that the gold standard or anything closely resembling it will be reestablished in the foreseeable future.

21.2B The Interwar Experience

With the outbreak of World War I, the classical gold standard came to an end. Between 1919 and 1924, exchange rates fluctuated wildly, and this led to a desire to return to the stability of the gold standard. In April 1925, the United Kingdom reestablished the convertibility of the pound into gold *at the prewar price* and lifted the embargo on gold exports that it had imposed at the outbreak of World War I. Other nations followed the United Kingdom’s lead and went back to gold. (The United States had already returned to gold in 1919.) However, the new system was more in the nature of a gold-exchange standard than a pure gold standard in that both gold and currencies convertible into gold (mostly pounds but also U.S. dollars and French francs) were used as international reserves. This economized on gold, which (at the prewar price and in the face of a substantial increase in other prices as a result of the war) had become a much smaller percentage of the total value of world trade.

Since the United Kingdom had lost a great deal of its competitiveness (especially to the United States) and had liquidated a substantial portion of its foreign investments to pay for the war effort, reestablishing the prewar parity left the pound grossly overvalued (see the discussion of Cassell’s purchasing-power theory in Section 15.2). This led to balance-of-payments deficits and to deflation as the United Kingdom attempted to contain its deficits. On the other hand, France faced large balance-of-payments surpluses after the franc was stabilized at a depreciated level in 1926.

Seeking to make Paris an international monetary center in its own right, France passed a law in 1928 requiring settlement of its balance-of-payments surpluses in gold rather than in pounds or other currencies. This was a serious drain on the meager U.K. gold reserves and led to a shift of short-term capital from London to Paris and New York. When France also sought to convert all of its previously accumulated pounds into gold, the United Kingdom was forced in September 1931 to suspend the convertibility of the pound into gold, which devalued the pound, and the gold-exchange standard came to an end. (The United States actually went off gold in 1933.)

While France's decision to convert all of its pounds into gold was the immediate cause of the collapse of the gold-exchange standard, the more fundamental causes were (1) the lack of an adequate adjustment mechanism as nations sterilized the effect of balance-of-payments disequilibria on their money supplies in the face of grossly inappropriate parities, (2) the huge destabilizing capital flows between London and the emerging international monetary centers of New York and Paris, and (3) the outbreak of the Great Depression (to which the malfunction of the international monetary system contributed). However, it is likely that any international monetary system would have collapsed under the tremendous strain of worldwide depression.

There followed, from 1931 to 1936, a period of great instability and competitive devaluations as nations tried to "export" their unemployment. The United States even devalued the dollar (by increasing the dollar price of gold from $20.67 to $35 an ounce) in 1933–1934, from a position of balance-of-payments *surplus*, in order to stimulate its exports. Needless to say, this was a serious policy mistake. Expansionary domestic policies would have stimulated the U.S. economy and at the same time corrected or reduced its balance-of-payments surplus. By 1936, exchange rates among the major currencies were approximately the same as they had been in 1930, before the cycle of competitive devaluations began. The only effect was that the value of gold reserves was increased. However, most foreign exchange reserves had been eliminated by mass conversions into gold as protection against devaluations.

This was also a period when nations imposed very high tariffs and other serious import restrictions, so that international trade was cut almost in half. For example, in 1930 the United States passed the *Smoot–Hawley Tariff Act*, which raised U.S. import duties to an all-time high (see Section 9.6A). By 1939, of course, depression gave way to full employment—and war.

According to *Nurkse*, the interwar experience clearly indicated the prevalence of destabilizing speculation and the instability of flexible exchange rates. This experience strongly influenced the Allies at the close of World War II to establish an international monetary system with some flexibility but with a heavy emphasis on fixity as far as exchange rates were concerned. (This is discussed in the next section.) More recently, the interwar experience has been reinterpreted to indicate that the wild fluctuations in exchange rates during the 1919–1924 period reflected the serious pent-up disequilibria that had developed during World War I and the instability associated with postwar reconstruction, and that in all likelihood no fixed exchange rate system could have survived during this period.

21.3 The Bretton Woods System

In this section, we describe the Bretton Woods system and the International Monetary Fund (the institution created to oversee the operation of the new international monetary system and provide credit to nations facing temporary balance-of-payments difficulties).

21.3A The Gold-Exchange Standard (1947–1971)

In 1944, representatives of the United States, the United Kingdom, and 42 other nations met at Bretton Woods, New Hampshire, to decide on what international monetary system to establish after the war. The system devised at Bretton Woods called for the establishment of the International Monetary Fund (IMF) for the purposes of (1) overseeing that nations followed a set of agreed upon rules of conduct in international trade and finance and (2) providing *borrowing* facilities for nations in *temporary* balance-of-payments difficulties.

The new international monetary system reflected the plan of the American delegation, drawn up by *Harry D. White* of the U.S. Treasury, rather than the plan submitted by *John Maynard Keynes*, who headed the British delegation. Keynes had called for the establishment of a *clearing union* able to *create* international liquidity based on a new unit of account called the "bancor," just as a national central bank (the Federal Reserve in the United States) can create money domestically. The IMF opened its doors on March 1, 1947, with a membership of 30 nations. With the admission of the Soviet Republics and other nations during the 1990s, IMF membership reached 187 at the beginning of 2012. Only a few countries, such as Cuba and North Korea, are not members.

The Bretton Woods system was a gold-exchange standard. The United States was to maintain the price of gold fixed at $35 per ounce and be ready to exchange on demand dollars for gold at that price without restrictions or limitations. Other nations were to fix the price of their currencies in terms of dollars (and thus implicitly in terms of gold) and intervene in foreign exchange markets to keep the exchange rate from moving by more than 1 percent above or below the par value. Within the allowed band of fluctuation, the exchange rate was determined by the forces of demand and supply.

Specifically, a nation would have to draw down its dollar reserves to purchase its own currency in order to prevent it from depreciating by more than 1 percent from the agreed par value, or the nation would have to purchase dollars with its own currency (adding to its international reserves) to prevent an appreciation of its currency by more than 1 percent from the par value. Until the late 1950s and early 1960s, when other currencies became fully convertible into dollars, the U.S. dollar was the only intervention currency, so that the new system was practically a gold-dollar standard.

Nations were to finance temporary balance-of-payments deficits out of their international reserves and by borrowing from the IMF. Only in a case of fundamental disequilibrium was a nation allowed, after the approval of the Fund, to change the par value of its currency. Fundamental disequilibrium was nowhere clearly defined but broadly referred to large and persistent balance-of-payments deficits or surpluses. Exchange rate changes of less than 10 percent were, however, allowed without Fund approval. Thus, the Bretton Woods system was in the nature of an adjustable peg system, at least as originally conceived, combining general exchange rate stability with some flexibility. The stress on fixity can best be understood as resulting from the strong desire of nations to avoid the chaotic conditions in international trade and finance that prevailed during the interwar period.

After a period of transition following the war, nations were to remove all restrictions on the full convertibility of their currencies into other currencies and into the U.S. dollar. Nations were forbidden to impose additional trade restrictions (otherwise currency convertibility would not have much meaning), and existing trade restrictions were to be removed gradually in multilateral negotiations under the sponsorship of GATT (see Section 9.6B).

Restrictions on international liquid capital flows were, however, permitted to allow nations to protect their currencies against large destabilizing, or “hot,” international money flows.

Borrowing from the Fund (to be described below) was restricted to cover temporary balance-of-payments deficits and was to be repaid within three to five years so as not to tie up the Fund’s resources in long-term loans. *Long-run* development assistance was to be provided by the International Bank for Reconstruction and Development (IBRD or World Bank) and its affiliates, the International Finance Corporation (established in 1956 to stimulate *private* investments in developing nations from indigenous and foreign sources) and the International Development Association (established in 1960 to make loans at subsidized rates to the poorer developing nations).

The Fund was also to collect and propagate balance-of-payments, international trade, and other economic data of member nations. Today the IMF publishes, among other things, *International Financial Statistics* and *Direction of Trade Statistics*, the most authoritative sources of comparable time series data on the balance of payments, trade, and other economic indicators of member nations.

21.3B Borrowing from the International Monetary Fund

Upon joining the IMF, each nation was assigned a quota based on its economic importance and the volume of its international trade. The size of a nation’s quota determined its voting power and its ability to borrow from the Fund. The total subscription to the Fund was set in 1944 at $8.8 billion. As the most powerful nation, the United States was assigned by far the largest quota, 31 percent. Every five years, quotas were to be revised to reflect changes in the relative economic importance and international trade of member nations. At the end of 2011, the total subscription of the Fund had grown to 238.0 billion SDRs ($369.2 billion) through increases in membership and periodic increases in quotas. The U.S. quota had declined to 16.80 percent of the total, the quotas of Japan and Germany were, respectively, 6.25 and 5.83, and that of France and the United Kingdom was 4.30 percent. China, with 10.0 percent of the global economy, had a quota of 3.82 percent.

Upon joining the IMF, a nation was to pay 25 percent of its quota to the Fund in gold and the remainder in its own currency. In borrowing from the Fund, the nation would get convertible currencies approved by the Fund in exchange for depositing equivalent (and additional) amounts of its own currency into the Fund, until the Fund held no more than 200 percent of the nation’s quota in the nation’s currency.

Under the original rules of the Fund, a member nation could borrow no more than 25 percent of its quota in any one year, up to a total of 125 percent of its quota over a five-year period. The nation could borrow the first 25 percent of its quota, the gold tranche, almost automatically, without any restrictions or conditions. For further borrowings (in subsequent years), the credit tranches, the Fund charged higher and higher interest rates and imposed more and more supervision and conditions to ensure that the deficit nation was taking appropriate measures to eliminate the deficit.

Repayments were to be made within three to five years and involved the nation’s repurchase of its own currency from the Fund with other convertible currencies approved by the Fund, until the IMF once again held no more than 75 percent of the nation’s quota in the nation’s currency. The Fund allowed repayments to be made in currencies of which it held less than 75 percent of the issuing nation’s quota. If before a nation (Nation A) completed repayment, another nation (Nation B) borrowed Nation A's currency from the Fund, then Nation A would end repayment of its loan as soon as the Fund's holdings of Nation A's currency reached 75 percent of its quota.

If the Fund's holding of a nation's currency fell below 75 percent of its quota, the nation could borrow the difference from the Fund without having to repay its loan. This was called the super gold tranche. In the event that the Fund ran out of a currency altogether, it would declare the currency "scarce" and allow member nations to discriminate in trade against the scarce-currency nation. The reason for this was that the Fund viewed balance-of-payments adjustments as the joint responsibility of both deficit and surplus nations. However, the Fund has never been called upon to invoke this scarce-currency provision during its many years of operation.

A nation's gold tranche plus its super gold tranche (if any), or minus the amount of its borrowing (if any), is called the nation's net IMF position. Thus, the nation's net IMF position is given by the size of its quota minus the Fund's holding of its currency. The amount of gold reserves paid in by a nation upon joining the Fund was called the nation's reserve position in the Fund and was added to the nation's other international reserves of gold, Special Drawing Rights (SDRs—see the next section), and other convertible currencies to obtain the total value of the nation's international reserves (see Section 13.3).

21.4 Operation and Evolution of the Bretton Woods System

In this section, we examine the operation of the Bretton Woods system from 1947 until it collapsed in 1971. We also examine the way in which the system evolved over the years in response to changing conditions from the blueprint agreed upon in 1944.

21.4A Operation of the Bretton Woods System

While the Bretton Woods system envisaged and allowed changes in par values in cases of fundamental disequilibrium, in reality industrial nations were very reluctant to change their par values until such action was long overdue and was practically forced on them by the resulting destabilizing speculation. Deficit nations were reluctant to devalue their currencies because they regarded this as a sign of national weakness. Surplus nations resisted needed revaluations, preferring instead to continue accumulating international reserves. Thus, from 1950 until August 1971, the United Kingdom devalued only in 1967; France devalued only in 1957 and 1969; West Germany *revalued* in 1961 and 1969; and the United States, Italy, and Japan never changed their par values. Meanwhile, Canada (defying the rules of the IMF) had fluctuating exchange rates from 1950 to 1962 and then reinstituted them in 1970. Developing nations, on the other hand, devalued all too often.

The unwillingness of industrial nations to change their par values as a matter of policy when in fundamental disequilibrium had two important effects. First, it robbed the Bretton Woods system of most of its flexibility and the mechanism for adjusting balance-of-payments disequilibria. We will see in Section 21.5 that this played a crucial role in the collapse of the system in August 1971. Second, and related to the first point, the reluctance of industrial nations to change their par value when in fundamental disequilibrium gave rise to huge destabilizing international capital flows by providing an excellent one-way gamble for speculators.

Specifically, a nation such as the United Kingdom, with chronic balance-of-payments deficits over most of the postwar period, was plagued by huge liquid capital outflows in the expectation that the pound would be devalued. Indeed, these expectations became self-fulfilling, and the United Kingdom was forced to devalue the pound in 1967 (after a serious deflationary effort to avoid the devaluation). On the other hand, a nation such as West Germany, with chronic balance-of-payments surpluses, received huge capital inflows in the expectation that it would revalue the mark. This made revaluation of the mark inevitable in 1961 and again in 1969.

The convertibility of the dollar into gold resumed soon after World War II. The major European currencies became convertible for current account purposes de facto in 1958 and de jure, or formally, in 1961. The Japanese yen became formally convertible into U.S. dollars and other currencies in 1964. As pointed out in Section 21.3A, capital account restrictions were permitted to allow nations some protection against destabilizing capital flows. Despite these restrictions, the postwar era experienced periods of huge destabilizing capital flows, which became more frequent and more disruptive, culminating in the collapse of the Bretton Woods system in August 1971. These large destabilizing "hot" money flows were facilitated by the establishment and rapid growth of *Eurocurrency markets* during the 1960s (see Section 14.7).

Under the *Trade Expansion Act of 1962* and *GATT* auspices (see Section 9.6C), the United States initiated and engaged in wide-ranging multilateral trade negotiations (the *Kennedy Round*), which lowered average tariffs on manufactured goods to less than 10 percent. However, many nontariff barriers to international trade remained, especially in agriculture and on simple manufactured goods, such as textiles, which are of special importance to developing nations. This was also the period when several attempts were made at economic integration, the most successful being the European Union (EU), then called the European Common Market (see Section 10.6A).

21.4B Evolution of the Bretton Woods System

Over the years, the Bretton Woods system evolved (until 1971) in several important directions in response to changing conditions. In 1962, the IMF negotiated the General Arrangements to Borrow (GAB) up to $6 billion from the so-called Group of Ten most important industrial nations (the United States, the United Kingdom, West Germany, Japan, France, Italy, Canada, the Netherlands, Belgium, and Sweden) and Switzerland to supplement its resources, if needed, to help nations with balance-of-payments difficulties. This sum of $6 billion was over and above the periodic increases in the Articles of Agreement that established the IMF. The GAB was renewed and expanded in subsequent years.

Starting in the early 1960s, member nations began to negotiate standby arrangements. These refer to advance permission for future borrowings by the nation at the IMF. Once a standby arrangement was negotiated, the nation paid a small commitment charge of one-fourth of 1 percent of the amount earmarked and was then able to borrow up to this additional amount *immediately* when the need arose at a 5.5 percent charge per year on the amount actually borrowed. Standby arrangements were usually negotiated by member nations as a first line of defense against anticipated destabilizing hot money flows. After several increases in quotas, the total resources of the Fund reached $28.5 billion by 1971 (of which $6.7 billion, or about 23.5 percent, was the U.S. quota). By the end of 1971, the Fund had lent about $22 billion (mostly after 1956), of which about $4 billion was outstanding. The Fund also changed the rules and allowed member nations to borrow up to 50 percent of their quotas in any one year (up from 25 percent).

National central banks also began to negotiate so-called swap arrangements to exchange each other's currency to be used to intervene in foreign exchange markets to combat hot money flows. A central bank facing large liquid capital flows could then sell the foreign currency forward in order to increase the forward discount or reduce the forward premium on the foreign currency and discourage destabilizing hot money flows (see Sections 14.3 to 14.6). Swap arrangements were negotiated for specific periods of time and with an exchange rate guarantee. When due, they could either be settled by a reverse transaction or be renegotiated for another period. The United States and European nations negotiated many such swap arrangements during the 1960s.

The most significant change introduced into the Bretton Woods system during the 1947–1971 period was the creation of Special Drawing Rights (SDRs) to supplement the international reserves of gold, foreign exchange, and reserve position in the IMF. Sometimes called *paper gold*, SDRs are accounting entries in the books of the IMF. SDRs are not backed by gold or any other currency but represent genuine international reserves *created* by the IMF. Their value arises because member nations have so agreed. SDRs can only be used in dealings among central banks to settle balance-of-payments deficits and surpluses and not in private commercial dealings. A charge of 1.5 percent (subsequently increased to 5 percent and now based on market rates) was applied on the amount by which a nation's holdings of SDRs fell short of or exceeded the amount of SDRs allocated to it. The reason for this was to put pressure on both deficit and surplus nations to correct balance-of-payments disequilibria.

At the 1967 meeting of the IMF in Rio de Janeiro, it was agreed to create SDRs in the amount of $9.5 billion to be distributed to member nations according to their quotas in the IMF in three installments in January 1970, 1971, and 1972. Further allocations of SDRs were made in the 1979–1981 period (see Section 21.6A). The value of one SDR was originally set equal to one U.S. dollar but rose above $1 as a result of the devaluations to the dollar in 1971 and 1973. Starting in 1974, the value of SDRs was tied to a basket of currencies, as explained in Section 21.6A.

In 1961 the so-called *gold pool* was started by a group of industrial nations under the leadership of the United States to sell officially held gold on the London market to prevent the price of gold from rising above the official price of $35 an ounce. This was discontinued as a result of the gold crisis of 1968 when a *two-tier gold market* was established. This kept the price of gold at $35 an ounce in official transactions among central banks, while allowing the commercial price of gold to rise above the official price and be determined by the forces of demand and supply in the market. These steps were taken to prevent depletion of U.S. gold reserves.

Over the years, membership in the IMF increased to include most nations of the world. Despite the shortcomings of the Bretton Woods system, the postwar period until 1971 was characterized by world output growing quite rapidly and international trade growing even faster. Overall, it can thus be said that the Bretton Woods system served the world community well, particularly until the mid-1960s (see Case Study 21-1).

CASE STUDY 21-1 Macroeconomic Performance under Different Exchange Rate Regimes

Table 21.1 presents some indicators of the macroeconomic performance of the United Kingdom and the United States under the gold standard, in the interwar period, and during the post-World War II period, under fixed and flexible exchange rates. The table shows that the growth in per capita income in both the United Kingdom and the United States was higher during the post-World War II period than during the gold standard period, inflation was higher, and unemployment was lower, except for the United Kingdom during 1973–2011. Thus, aside from the lower inflation rate, the macroeconomic performance of both countries was not better during the gold standard period as compared with the post-World War II period. On the other hand, the interwar period, dominated as it was by the Great Depression, was characterized by a generally worse macroeconomic performance than either under the gold standard or in the post-World War II period. The only exception is that the growth in real per capita income during the interwar period (despite the Great Depression) in the United States exceeded its growth during the gold standard period. Caution should be exercised, however, in comparing pre- to post-World War II not only because data for the former period were of poorer quality but also (and more importantly) because many other factors affecting growth were different in the two periods.

TABLE 21.1. Macroeconomic Performance of the United States and the United Kingdom under Different Exchange Rate Regimes, 1870–2011

	Average Growth in Real per Capita Income per Year	Rate of Inflation	Rate of Unemployment
Gold Standard:			
United Kingdom (1870–1913)	1.0	−0.7	4.3[a]
United States (1879–1913)	1.4	0.1	6.8[b]
Interwar period:			
United Kingdom (1919–1938)	0.6	−4.6	13.3
United States (1919–1940)	1.6	−2.5	11.3
Post-World War II period— Fixed exchange rate period:			
United Kingdom (1946–1972)	1.7	3.5	1.9
United States (1946–1972)	2.2	1.4	4.6
Post-World War II period— Flexible exchange rate period:			
United Kingdom (1973–2011)	2.0	5.9	7.5
United States (1973–2011)	2.8	4.2	6.5

[a]1888–1913; [b]1890–1913.

Sources: M. D. Bordo, "The Classical Gold Standard: Some Lessons for Today," in *Readings in International Finance* (Chicago: Federal Reserve Bank of Chicago, 1987), pp. 83–97; M. Friedman and A. J. Schwartz, *A Monetary History of the United States* (Princeton, N.J.: Princeton University Press, 1963); and Organization for Economic Cooperation and Development, *Economic Outlook* (Paris: OECD, various issues).

21.5 U.S. Balance-of-Payments Deficits and Collapse of the Bretton Woods System

In this section, we briefly examine the causes of the U.S. balance-of-payments deficits over most of the postwar period and their relationship to the collapse of the Bretton Woods system in August 1971. We then consider the more fundamental causes of the collapse of the system and their implications for the present managed floating exchange rate system.

21.5A U.S. Balance-of-Payments Deficits

From 1945 to 1949, the United States ran huge balance-of-payments surpluses with Europe and extended Marshall Plan aid to European reconstruction. With European recovery more or less complete by 1950, the U.S. balance of payments turned into deficit. Up to 1957, U.S. deficits were rather small, averaging about $1 billion each year. These U.S. deficits allowed European nations and Japan to build up their international reserves. This was the period of the dollar shortage. The United States settled its deficits mostly in dollars. Surplus nations were willing to accept dollars because (1) the United States stood ready to exchange dollars for gold at the fixed price of $35 an ounce, making the dollar "as good as gold"; (2) dollars could be used to settle international transactions with any other nation (i.e., the dollar was truly an international currency); and (3) dollar deposits earned interest while gold did not.

Starting in 1958, U.S. balance-of-payments deficits increased sharply and averaged over $3 billion per year. Contributing to the much larger U.S. deficits since 1958 was first the huge increase in capital outflows (mostly direct investments in Europe) and then the high U.S. inflation rate (connected with the excessive money creation during the Vietnam War period), which led, starting in 1968, to the virtual disappearance of the traditional U.S. trade balance surplus. The United States financed its balance-of-payments deficits mostly with dollars so that by 1970, foreign official dollar holdings were more than $40 billion, up from $13 billion in 1949. (Foreign private dollar holdings were even larger, and these could also be potential claims on U.S. gold reserves.) At the same time, U.S. gold reserves declined from $25 billion in 1949 to $11 billion in 1970.

Because the dollar was an international currency, the United States felt that it could not devalue to correct its balance-of-payments deficits. Instead, it adopted a number of other policies which, however, had only very limited success. One of these was the attempt in the early 1960s to keep short-term interest rates high to discourage short-term capital outflows, while at the same time trying to keep long-term interest rates relatively low to stimulate domestic growth (operation twist). The United States also intervened in foreign exchange markets and sold forward strong currencies, such as the German mark, to increase the forward discount and discourage liquid capital outflows under covered interest arbitrage (see Section 14.6). It also intervened in the spot market in support of the dollar.

The resources for these interventions in the spot and forward markets were usually obtained from swap arrangements with other central banks and from standby arrangements with the IMF. The United States took additional steps to encourage its exports, reduced military and other government expenditures abroad, and tied most of its foreign aid to be spent in the United States. Furthermore, during the 1963–1968 period, the United States introduced a number of direct controls over capital outflows. These were the Interest Equalization Tax, the Foreign Direct Investment Program, and restrictions on bank loans to foreigners.

As the U.S. deficits persisted and rose over time, U.S. gold reserves declined while foreign-held dollar reserves grew to the point where in the early 1960s they began to exceed the U.S. gold reserves. To discourage foreign official holders of dollars from converting their excess dollars into gold at the Federal Reserve and further reducing U.S. gold reserves, the United States created the so-called Roosa bonds. These were medium-term treasury bonds denominated in dollars but with an exchange rate guarantee. Nevertheless, U.S. gold reserves continued to decline, while foreign-held dollar reserves continued to rise. By 1970, they exceeded total U.S. gold reserves by a multiple of about 4.

In the face of large and persistent U.S. balance-of-payments deficits and sharply reduced U.S. gold reserves, it became evident that a realignment of parities was necessary. The United States sought unsuccessfully in 1970 and early 1971 to persuade surplus nations, particularly West Germany and Japan, to revalue their currencies. The expectation then became prevalent that the United States would sooner or later have to devalue the dollar. By now international capital markets had become highly integrated through Eurocurrency markets. This led to huge destabilizing capital movements out of dollars and into stronger currencies, particularly the German mark, the Japanese yen, and the Swiss franc. On August 15, 1971, President Nixon was forced to suspend the convertibility of dollars into gold. The "gold window" had been shut. The Bretton Woods system was dead. At the same time, the United States imposed wage and price controls as well as a temporary 10 percent import surcharge, to be lifted after the required currency realignment took place.

The ability of the United States to settle its balance-of-payments deficits with dollars had conferred an important privilege on the United States that was not available to other nations (which faced the strict limitation imposed by their limited supplies of gold and foreign exchange on the balance-of-payments deficits that they could incur). The benefit accruing to a nation from issuing the currency or when its currency is used as an international currency is referred to as seigniorage. However, the United States paid a heavy price for its seigniorage privilege. It was unable to devalue the dollar (as other nations, such as the United Kingdom and France, occasionally did) without bringing down the Bretton Woods system. The use of monetary policy was more constrained in the United States than in other nations. Consequently, the United States had to rely more heavily on fiscal policy to achieve domestic objectives and on ad hoc measures (such as controls over capital flows) to correct balance-of-payments deficits.

It is difficult to determine whether on balance the United States benefited or was harmed as a result of the dollar becoming an international currency. In any event, France, Germany, Japan, and other surplus nations began to view the United States as abusing its position as the world's banker by supplying excessive liquidity with its large and persistent balance-of-payments deficits. The unwillingness of Germany and Japan to revalue forced the United States to devalue the dollar, thus bringing the Bretton Woods system down. To a large extent, this was a political decision to remove the United States from its unique position as the "world's banker" or to take away from the United States this "exorbitant" privilege (to use Charles de Gaulle's words). The irony of it all is that the dollar remained an international currency without any backing of gold after the Bretton Woods system collapsed in August 1971 and even after the dollar was allowed to fluctuate in value in March 1973. Indeed, the amount of foreign-held dollars has risen dramatically in the years since 1971 (see Section 21.6).

21.5B Collapse of the Bretton Woods System

As explained earlier, the *immediate cause* of the collapse of the Bretton Woods system was the expectation in late 1970 and early 1971, in the face of huge balance-of-payments deficits, that the United States would soon be forced to devalue the dollar. This led to a massive flight of liquid capital from the United States, which prompted President Nixon to suspend the convertibility of the dollar into gold on August 15, 1971, and to impose a temporary 10 percent import surcharge.

In December 1971, representatives of the Group of Ten nations met at the Smithsonian Institution in Washington, D.C., and agreed to increase the dollar price of gold from $35 to $38 an ounce. This implied a devaluation of the dollar of about 9 percent. At the same time, the German mark was revalued by about 17 percent, the Japanese yen by about 14 percent, and other currencies by smaller amounts with respect to the dollar. In addition, the band of fluctuation was increased from 1 percent to 2.25 percent on either side of the new central rates, and the United States removed its 10 percent import surcharge. Since the dollar remained inconvertible into gold, the world was now essentially on a dollar standard. President Nixon hailed this Smithsonian Agreement as the "most significant monetary agreement in the history of the world" and promised that the dollar "would never again be devalued."

However, with another huge U.S. balance-of-payments deficit in 1972 ($9 billion—see Table 13.3), it was felt that the Smithsonian Agreement was not working and that another devaluation of the dollar was required. This expectation led to renewed speculation against the dollar and became self-fulfilling in February 1973, when the United States was once again forced to devalue the dollar, this time by about 10 percent (achieved by increasing the official price of gold to $42.22 an ounce). At the same time, the dollar remained inconvertible into gold. In March 1972, the original six member nations of the European Common Market decided to let their currencies float jointly against the dollar with a *total* band of fluctuation of only 2.25 percent, instead of the 4.5 percent agreed on in December 1971. This was named the *European snake* or the "snake in the tunnel" and lasted until March 1973.

When speculation against the dollar flared up again in March 1973, monetary authorities in the major industrial nations decided to let their currencies float either independently (the U.S. dollar, the British pound, the Japanese yen, the Italian lira, the Canadian dollar, and the Swiss franc) or jointly (the German mark, the French franc, and the currencies of six other central and northern European nations—the snake with the maximum total spread of 2.25 percent between the strongest and the weakest currency with respect to the dollar). The present managed floating exchange rate system was born. France abandoned the snake in 1974, Norway in 1977, and Sweden in 1978. (The United Kingdom, Italy, and Ireland had not joined in 1973.)

While the immediate cause of the collapse of the Bretton Woods system was the huge balance-of-payments deficits of the United States in 1970 and 1971, the *fundamental* cause is to be found in the interrelated problems of liquidity, adjustment, and confidence. Liquidity refers to the amount of international reserves available in relation to the need for them. International reserves comprise official holdings of gold, foreign exchange (mostly U.S. dollars), the reserve position of member nations in the IMF, and SDRs. Table 21.2 shows that most of the increase in liquidity under the Bretton Woods system resulted from the increase in official holdings of foreign exchange, mostly dollars, to finance U.S. balance-of-payments deficits.

TABLE 21.2. International Reserves, 1950–1973, Selected Years (billions of U.S. dollars, at year end)

	1950	1960	1969	1970	1971	1972	1973
Gold (at official price)	33	38	39	37	36	36	36
Foreign exchange	13	19	33	45	75	96	102
SDRs	—	—	—	3	6	9	9
Reserve position in the IMF	2	4	7	8	6	6	6
Total	48	61	79	93	123	147	153

Source: International Monetary Fund, *International Financial Statistics Yearbook*, 1989.

In Table 21.2, all international reserves are expressed in terms of U.S. dollars, even though the IMF now expresses all international reserves in terms of SDRs. One SDR was equal to $1 up to 1970, about $1.09 in 1971 and 1972, and about $1.21 in 1973 (see Section 21.6A). Gold reserves were valued at the official price of gold of $35 an ounce up to 1970, at $38 an ounce in 1971 and 1972, and at $42.22 an ounce in 1973. Valued at the London free market price of gold of $112.25 an ounce prevailing at the end of 1973, total world gold reserves were $115 billion. For simplicity, all reserves were valued in U.S. dollars instead of SDRs and gold reserves were valued at official prices.

International liquidity is needed so that nations can finance temporary balance-of-payments deficits without trade restrictions while the adjustment mechanisms supposedly operate to eventually correct the deficit. Inadequate liquidity hampers the expansion of world trade. On the other hand, excessive liquidity leads to worldwide inflationary pressures. But this raised a serious dilemma, according to *Robert Triffin* (1961). Under the Bretton Woods system, most liquidity was provided by an increase in foreign exchange arising from U.S. balance-of-payments deficits. However, the longer these balance-of-payments deficits persisted and the more unwanted dollars accumulated in foreign hands, the smaller was the confidence in the dollar. The dollar shortage of the 1950s had given way to the dollar glut of the 1960s.

It was in response to this problem and in the hope that the United States would soon be able to correct its deficits that the IMF decided to create $9.5 billion of SDRs in 1967. These SDRs were distributed in three installments in January 1970, 1971, and 1972, at the very time when the world was suffering from excessive increases in liquidity resulting from huge U.S. balance-of-payments deficits. Note that the increase in SDRs from 1970 to 1971 and 1972 shown in Table 21.2 reflects not only the new installments of SDRs distributed to member nations in January of 1971 and 1972 but also the increase in the dollar value of SDRs as a result of the dollar devaluation in December 1971. Similarly, there was no new distribution of SDRs between 1972 and 1973, but the value of one SDR rose from about $1.09 in 1972 to $1.21 in 1973.

As we have seen, the United States was unable to correct its large and persistent balance-of-payments deficits primarily because of its inability to devalue the dollar. Thus, the Bretton Woods system lacked an adequate adjustment mechanism that nations would be willing and able to utilize as a matter of policy. U.S. balance-of-payments deficits persisted, and this undermined confidence in the dollar. Thus, the fundamental cause of the collapse of the Bretton Woods system is to be found in the interrelated problems of adjustment, liquidity, and confidence.

21.6 The International Monetary System: Present and Future

In this section, we examine the operation of the present managed floating exchange rate system, discuss present IMF operation, identify the most important monetary and trade problems, and evaluate proposals for reforms.

21.6A Operation of the Present System

Since March 1973, the world has had a managed floating exchange rate system. Under such a system, nations' monetary authorities are entrusted with the responsibility to intervene in foreign exchange markets to smooth out short-run fluctuations in exchange rates without attempting to affect long-run trends. This could be achieved by a policy of leaning against the wind (see Section 20.6D). To be sure, this system was not deliberately chosen but was imposed on the world by the collapse of the Bretton Woods system in the face of chaotic conditions in foreign exchange markets and huge destabilizing speculation.

In the early days of the managed floating system, serious attempts were made to devise specific rules for managing the float to prevent competitive exchange rate depreciations (which nations might use to stimulate their exports), thus possibly returning to the chaotic conditions of the 1930s. However, as the worst fears of abuse did not materialize, all of these attempts failed. Indeed, the 1976 Jamaica Accords formally recognized the managed floating system and allowed nations the choice of foreign exchange regime as long as their actions did not prove disruptive to trade partners and the world economy. These Jamaica Accords were ratified and took effect in April 1978.

At the beginning of 2012, half of the 187 nations that were members of the IMF had opted for some form of exchange rate flexibility. These included practically all the industrial nations and many large developing nations, so that more than four-fifths of total world trade moved between nations with managed exchange rates, either independently or jointly (as in the European Union). Most of the remaining nations adopted the currency of another nation (i.e., dollarized), operated under a currency board arrangement (CBA), or pegged their currencies to the U.S. dollar, the euro, or a basket of currencies (see Section 20.6 and Table 20.4). During the period from 1974 to 1977, again from 1981 to 1985, and since the early 1990s, the United States generally followed a policy of benign neglect by not intervening in foreign exchange markets to stabilize the value of the dollar.

In March 1979, the European Monetary System (EMS) was formed and in January 1999, the European Monetary Union (EMU) came into existence with the creation of the euro (which began actual circulation at the beginning of 2002) and the European Central Bank (ECB) beginning operation (see Section 20.4).

Under the present managed float, nations still need international reserves in order to intervene in foreign exchange markets to smooth out short-run fluctuations in exchange rates. At present, such interventions are still made mostly in dollars. In January 1975, U.S. citizens were allowed for the first time since 1933 to own gold (other than in jewelry), and the United States sold a small portion of its gold holdings on the free market. The price of gold on the London market temporarily rose above $800 an ounce in January 1980, but it soon fell and stabilized at about half of its peak price; it then rose to the all-time price high

■ TABLE 21.3. International Reserves in 2011 (billions of U.S. dollars and SDRs, at year end)

	U.S. Dollars	SDRs
Foreign exchange	10,196.4	6,641.3
SDRs	313.4	204.1
Reserve position in the IMF	150.9	98.3
Total minus gold	10,660.7	6,943.7
Gold at official price	34.8	22.7
Total with gold at official price	10,695.5	6,966.4

Source: International Monetary Fund, *International Financial Statistics* (Washington, D.C.: IMF, March 2012).

of $1,896.50 an ounce on September 5, 2001. As part of the Jamaica Accords, the IMF sold one-sixth of its gold holdings on the free market between 1976 and 1980 (and used the proceeds to aid the poorest developing nations) to demonstrate its commitment to eliminate gold (the "barbarous relic"—to use Keynes's words) as an international reserve asset. The official price of gold was abolished, and it was agreed that there would be no future gold transactions between the IMF and member nations. The IMF also continued to value its gold holdings at the pre-1971 official price of $35 or 35 SDRs an ounce. However, it may be some time before gold completely "seeps out" of international reserves—if it ever will. In the fall of 1996, the IMF agreed to sell about $2 billion of its gold holdings and use the proceeds to reduce the foreign debt of the poorest developing countries.

One SDR was valued at $1.00 up to 1971, $1.0857 after the dollar devaluation of December 1971, and $1.2064 after the subsequent dollar devaluation of February 1973. In 1974, the value of one SDR was made equal to the weighted average of a basket of 16 leading currencies in order to stabilize its value. In 1981, the number of currencies included in the basket was reduced to five and, with the advent of the euro, to the following four (with their respective relative weights in 2001 given in parentheses): U.S. dollar (45 percent); euro (29 percent); Japanese yen (15 percent); and British pound (11 percent). At the end of 2011, one SDR was valued at $1.5353.

Since 1974, the IMF has measured all reserves and other official transactions in terms of SDRs instead of U.S. dollars. Table 21.3 shows the composition of international reserves both in U.S. dollars and in SDRs (valued at $1.5353 at the end of 2011). For the composition of international reserves from 1950 to 2011 in terms of SDRs, as presented by the IMF, see Table 21.7 in the appendix.

21.6B Current IMF Operation

Several recent changes have occurred in the operation of the IMF. The quotas of IMF member nations have been increased across the board several times, so that at the end of 2011, resources totaled $369.2 billion (up from $8.8 billion in 1947). Members are generally required to pay 25 percent of any increase in their quota in SDRs or in currencies of other members selected by the Fund, with their approval, and the rest in their own currency. New members pay in their quota in the same way. The old gold tranche is now called the first-credit tranche.

The IMF has also renewed and expanded the General Arrangements to Borrow (GAB) ten times since setting them up in 1962; and in 1997, it extended it with the New Arrangement to Borrow (NAB), so that at the end of 2011, the IMF could lend up to SDR $564.2 billion to supplement its regular resources. Central bankers also expanded their swap arrangements to over $54 billion and their standby arrangements to $92 billion. Borrowing rules at the Fund were also relaxed, and new credit facilities were added that greatly expanded the overall maximum amount of credit available to a member nation. However, this total amount of credit consists of several different credit lines subject to various conditions. The IMF loans are now specified in terms of SDRs. There is an initial fee, and the interest charged is based on the length of the loan, the facility used, and prevailing interest rates. Besides the usual surveillance responsibilities over the exchange rate policies of its members, the Fund has recently broadened its responsibilities to include help for members to overcome their structural problems.

The new credit facilities set up by the IMF include (1) the Extended Fund Facility (EFF), established in 1974 for long-term assistance to support members' structural reforms to address balance of payments difficulties of a long-term character; (2) the Supplemental Reserve Facility (SRF), established in December 1997 during the Asian Crisis, to provide short-term assistance for balance-of-payments difficulties related to crises of market confidence; (3) the Compensatory and Contingency Financing Facility (CCFF), set up in 1963 to provide medium-term assistance for temporary export shortfalls or cereal import excesses; (4) the flexible credit line (FCL), created in March 2009, to provide assistance in crisis prevention; (5) the Precautionary Credit Line (PCL), available to a wider group of countries than the FCL; (6) the Post-Catastrophe Debt Relief (PCDR) Trust, established to allow the Fund to join international debt relief efforts when poor countries are hit by the most catastrophic of natural disasters; and the Systematic Transformation Facility (STF) to provide longer-term assistance for deep-seated balance of payments difficulties of a structural nature to encourage poverty-reducing growth.

A member country's overall access to Fund resources is now up to 200 percent of its quota in any single year, or twice the old cumulative limit of 100 percent, with a cumulative limit of 600 percent of a member's quota. The recipients of the loans as well as the type of loans made by the Fund also changed significantly over time. During the first 20 years of its existence, industrial countries accounted for over half of the use of Fund resources, and loans were made primarily to overcome short-term balance-of-payments problems. Since the early 1980s, most loans have been made to developing countries, and an increasing share of these loans has been made for the medium term in order to overcome structural problems. Total Fund credit and loans outstanding were $14.0 billion in 1980, $41.0 billion in 1986, and $100 billion at the end of 2011.

In the face of the huge international debt problems of many developing countries since 1982, particularly the large countries of Latin America, the IMF engaged in a number of debt rescheduling and rescue operations. As a condition for the additional loans and special help, the IMF usually required reductions in government spending, in growth of the money supply, and in wage increases in order to reduce imports, stimulate exports, and make the country more nearly self-sustaining. Such IMF conditionality, however, proved to be very painful and led to riots and even the toppling of governments during the late 1980s and 1990s. It also led to accusations that the IMF did not take into account the social needs of debtor nations and the political consequences of its demands, and that its policies were "all head and no heart." Partly in response to these accusations, the IMF has become more flexible in its lending activities in recent years and has begun to grant even medium term loans to overcome structural problems (something that was traditionally done only by the World Bank).

In 2006, the Fund proposed some fundamental reforms of its mission toward more multilateral surveillance, such as addressing the issue of global imbalances of big member countries like the United States and China, as well as providing greater representation to Asian emerging markets, especially China, to reflect their growing economic importance, rather than focusing (as in past decades) primarily on the challenges of global poverty of its low-income members and on international financial crises that affected only a small group of vulnerable emerging-market economies.

By way of summary, Table 21.4 presents the most important dates in modern monetary history.

TABLE 21.4. Important Dates in Modern Monetary History

1880–1914	Classical gold standard period
April 1925	United Kingdom returns to the gold standard
October 1929	United States stock market crashes
September 1931	United Kingdom abandons the gold standard
February 1934	United States raises official price of gold from \$20.67 to \$35 an ounce
July 1944	Bretton Woods Conference
March 1947	IMF begins operation
September 1967	Decision to create SDRs
March 1968	Two-tier gold market established
August 1971	United States suspends convertibility of the dollar into gold—end of Bretton Woods system
December 1971	Smithsonian Agreement (official price of gold increased to \$38 an ounce; band of allowed fluctuation increased to 4.5%)
February 1973	United States raises official price of gold to \$42.22 an ounce
March 1973	Managed floating exchange rate system comes into existence
October 1973	OPEC selective embargo on petroleum exports and start of sharp increase in petroleum prices
January 1976	Jamaica Accords (agreement to recognize the managed float and abolish the official price of gold)
April 1978	Jamaica Accords take effect
Spring 1979	Second oil shock
March 1979	Establishment of the European Monetary System (EMS)
January 1980	Gold price rises temporarily above \$800 per ounce
September 1985	Plaza agreement to intervene to lower value of dollar
Fall 1986	New round of GATT multilateral trade negotiations begins
February 1987	Louvre agreement to stabilize exchange rates
October 1987	New York Stock Exchange collapses and spreads to other stock markets around the world
1989–1990	Democratic and market reforms begin in Eastern Europe and German reunification occurs
December 1991	Maastricht Treaty approved calling for European Union to move toward monetary union by 1997 or 1999
December 1991	Soviet Union dissolved and Commonwealth of Independent States (CIS) formed
September 1992	United Kingdom and Italy abandon Exchange Rate Mechanism (ERM)
January 1, 1993	European Union (EU) becomes a single unified market

(continued)

TABLE 21.4. *(continued)*

August 1, 1993	European Monetary System allows ±15% fluctuation in exchange rates
December 1993	Uruguay Round completed and World Trade Organization (WTO) replaces GATT
January 1, 1994	North American Free Trade Agreement (NAFTA) comes into existence
January 1, 1994	Creation of the European Monetary Institute (EMI) as the forerunner of the European Central Bank by the European Union
January 1, 1999	Introduction of the single currency (the euro) and European Union-wide monetary policy by the European Central Bank (ECB)
October 2000	Euro falls to lowest level with respect to the dollar
January 1, 2002	Euro begins circulation as the currency of the 12-member European Monetary Union (EMU)
December 2006	U.S. current account deficit reaches all-time high of 6 percent of GDP
July 15, 2008	Euro reaches the all-time high of $1.60
September 15, 2008	Lehman Brothers files for bankruptcy, leading to full global financial crisis
September 5, 2011	Gold price reaches the all-time high of $1,896.50 an ounce
February 2012	Greece restructures its debt, thus avoiding default and possibly abandoning the euro

21.6c Problems with Present Exchange Rate Arrangements

The present international monetary system faces a number of serious and closely interrelated international monetary problems today. These are (1) the large volatility and the wide and persistent misalignments of exchange rates; (2) the failure to promote greater coordination of economic policies among the leading industrial nations; and (3) the inability to prevent international financial crises or to deal with them adequately when they do arise.

We have seen in Sections 14.5A and 15.5A that since 1973 exchange rates have been characterized by very large volatility and overshooting. This state of affairs can discourage the flow of international trade and investments. Much more serious is the fact that under the present managed floating exchange rate system large exchange rate disequilibria can arise and persist for several years (see Figure 14.3 and Section 14.5A). This is clearly evident from the large appreciation of the dollar from 1980 to 1985 and its even larger depreciation from February 1985 until the end of 1987. More recently, the yen–dollar exchange rate swung from 85 yen to the dollar in April 1995, to 132 yen to the dollar in February 2002, and 78 at the end of 2011. From January 1, 1999, to October 2000, the euro depreciated from $1.17 to $0.82, before rising to $1.36 in December 2004, falling to $1.18 in November 2005, and then rising to the all-time high of $1.60 on July 15, 2008. The excessive appreciation of the dollar during the first half of the 1980s and the overvaluation of the late 1990s and early 2000s has been associated with large and unsustainable trade deficits and calls for protectionism in the United States. It has also led to renewed calls for reform of the present international monetary system, along the lines of establishing target zones of allowed fluctuations for the major currencies and more international policy coordination among the leading nations. The earlier debate on the relative merits of fixed versus flexible rates has now been superseded by discussions of the optimal degree of exchange rate flexibility and policy cooperation.

Some increased cooperation has already occurred. For example, in September 1985, the United States negotiated with Germany, Japan, France, and the United Kingdom (in the so-called Plaza Agreement in New York City), a coordinated effort to intervene in foreign exchange markets to lower the value of the dollar. In 1986, the United States negotiated with Japan and Germany a simultaneous coordinated reduction in interest rates to stimulate growth and reduce unemployment (which exceeded 10 percent of the labor force in most nations of Europe during most of the 1980s) without directly affecting trade and capital flows (see Section 18.6c). The leading industrial nations are now paying much more attention to the international repercussions of their monetary and other policy changes. In February 1987, the G-7 nations agreed at the Louvre to establish soft reference ranges or target zones for the dollar–yen and the dollar–mark exchange rates (without, however, much success). Other examples of international monetary cooperation were the quick, coordinated response to the October 1987 worldwide stock market crash; to the September 11, 2001, terrorist attacks on the United States; and to some extent to the deep recession in advanced economies and sharply reduced growth in emerging markets in 2008–2009.

A closely related problem to exchange rate misalignments is the huge dollar overhang, or large quantity of dollars held by foreigners and ready to move from monetary center to monetary center in response to variations in international interest differentials and expectations of exchange rate changes. These "hot money" flows have been greatly facilitated by the extremely rapid growth of Eurocurrency markets (see Section 14.7). One proposal of long standing aimed at eliminating this problem involves converting all foreign-held dollars into SDRs by the introduction of a substitution account by the IMF. No action, however, has been taken on this proposal, and there are several unresolved problems, such as what interest rate to pay on these SDRs and the procedure whereby the United States can buy these dollars back from the IMF. At least for the foreseeable future, the dollar will likely remain the leading international and intervention currency (see Case Studies 14-1 and 14-2).

21.6D Proposals for Reforming Present Exchange Rate Arrangements

Several proposals have been advanced to reduce exchange rate volatility and avoid large exchange rate misalignments. One proposal, first advanced by *Williamson* (1986), is based on the establishment of *target zones*. Under such a system, the leading industrial nations estimate the equilibrium exchange rate and agree on the range of allowed fluctuation. Williamson suggested a band of allowed fluctuation of 10 percent above and below the equilibrium exchange rate. The exchange rate is determined by the forces of demand and supply within the allowed band of fluctuation and is prevented from moving outside the target zones by official intervention in foreign exchange markets. The target zones would be soft, however, and would be changed when the underlying equilibrium exchange rate moves outside of or near the boundaries of the target zone. Though not made explicit, the leading industrial nations seemed to have agreed upon some such "soft" target or "reference zones" for the exchange rate between the dollar and the yen and between the dollar and the German mark at the Louvre agreement in February 1987 (but with the allowed band of fluctuation much smaller than the ± 10 percent advocated by Williamson). During the early 1990s, however, this tacit agreement was abandoned in the face of strong market pressure which saw the dollar depreciate very heavily with respect to the yen.

Critics of target zones believe that target zones embody the worst characteristics of fixed and flexible exchange rate systems. As in the case of flexible rates, target zones allow substantial fluctuation and volatility in exchange rates and can be inflationary. As in the case of fixed exchange rates, target zones can only be defended by official interventions in foreign exchange markets and thus reduce the monetary autonomy of the nation. In response to this criticism, *Miller and Williamson* (1988) extended their blueprint to require substantial policy coordination on the part of the leading industrial nations so as to reduce the need for intervention in foreign exchange markets to keep exchange rates within the target zones.

Other proposals for reforming the present international monetary system are based exclusively on extensive policy coordination among the leading countries. The best and most articulate of these proposals is the one advanced by *McKinnon* (1984, 1988). Under this system, the United States, Japan, and Germany (now the European Monetary Union) would fix the exchange rate among their currencies at their equilibrium level (determined by purchasing-power parity) and then closely coordinate their monetary policies to keep exchange rates fixed. A tendency for the dollar to depreciate vis-à-vis the yen would signal that the United States should reduce the growth rate of its money supply, while Japan should increase it. The net overall increase in the money supply of these three countries (or areas) would then be expanded at a rate consistent with the noninflationary expansion of the world economy.

Another proposal advocated by the IMF Interim Committee in 1986 was based on the development of *objective indicators* of economic performance to signal the type of coordinated macropolicies for nations to follow, under the supervision of the Fund, in order to keep the world economy growing along a sustainable noninflationary path. These objective indicators are the growth of GNP, inflation, unemployment, trade balance, growth of the money supply, fiscal balance, exchange rates, interest rates, and international reserves. A rise or fall in these objective indicators in a nation would signal the need for respectively restrictive or expansionary policies for the nation. Stability of the index for the world as a whole would be the anchor for noninflationary world expansion.

As long as nations have very different inflation–unemployment trade-offs, however, effective and substantial macroeconomic policy coordination is practically impossible. For example, during the 1980s and early 1990s, the United States seemed unable or unwilling to reduce its huge budget deficit substantially and rapidly. Germany has been unwilling to stimulate its economy even though it faced a high rate of unemployment, and Japan has been very reluctant to dismantle its protectionistic policies to allow more imports from the United States so as to help reduce the huge trade imbalance between the two nations. Empirical research has also shown that nations gain from international policy coordination about three-quarters of the time but that the welfare gains from coordination, when they occur, are not very large (see Section 20.7).

Another class of proposals for reforming the present international monetary system is based on the premise that huge international capital flows in today's highly integrated international capital markets are the primary cause of exchange rate instability and global imbalances afflicting the world economy today. These proposals are, therefore, based on restricting international speculative capital flows. *Tobin* (1978) would do this with a transaction tax that would become progressively higher the shorter the duration of the transaction in order "to put some sand in the wheels of international finance." *Dornbusch and Frankel* (1987) would instead reduce financial capital flows internationally with dual exchange rates—a less flexible one for trade transactions and a more flexible one for purely financial transactions not related to international trade and investments. By restricting international "hot money" flows through capital market segmentation or the decoupling of asset markets, *Tobin, Dornbusch, and Frankel* believed that the international financial system could be made to operate much more smoothly and without any need for close policy coordination by the leading industrial countries, which they regard as neither feasible nor useful. Critics of these proposals, however, point out that it is next to impossible to separate "nonproductive" or speculative capital flows from "productive" ones related to international trade and investments. Finally, there is the single world currency advocated by *Mundell* because "a global economy requires a global currency."

It remains to be seen, however, if the leading nations are prepared to give up some of their autonomy in the coming years in order to have greater success in achieving their economic objectives. In the end, reform of the present international monetary system is likely to involve improving the functioning of the present system rather than replacing the present system by establishing a brand new one [see *Kenen* (1983, 2007); *Goldstein* (1995); *Eichengreen* (1999, 2008); *Salvatore* (2000, 2002, 2005, 2010, 2011, 2012); *Rajan* (2008, 2010); *Truman* (2006, 2009); *Dooley, Folkets-Landau, and Garbar* (2009); *Ghosh, Ostry, and Tsangarides* (2010); *Stigliz* (2010); *Klein and Shambaugh* (2010); *Reinhart and Rogoff* (2010); and *Razin and Rosefielde* (2011)].

21.6E Financial Crises in Emerging Market Economies

Another serious problem facing the present international monetary system is its seeming inability to prevent international financial crises in emerging and advanced market economies. There have been six crises in emerging markets since the mid-1990s: Mexico in 1994–1995, Southeast Asia in 1997–1999, Russia in summer 1998, Brazil in 1999, and Turkey and Argentina in 2001–2002 (see Case Studies 21-2 and 21-3). The IMF

CASE STUDY 21-2 The Anatomy of a Currency Crisis: The Collapse of the Mexican Peso

In December 1994, Mexico found itself in the grip of an intense financial crisis that triggered the deepest recession the country had faced in decades. The immediate cause for the crisis was the sharp increase in U.S. interest rates during 1994, which reversed the large United States to Mexico capital flow. This was aggravated by the political crisis triggered by the armed rebellion in the southern state of Chiapas in January 1994 and the murder of two high political officials later in 1994.

In order to reverse the resulting massive capital outflows, Mexico started to issue short-term, dollar-denominated securities and sharply increased domestic interest rates. Fearful that Mexico would not be able to service its loan obligations, however, foreign investors continued to pull funds out of Mexico. This forced Mexico to devalue the peso by 15 percent from 3.500 pesos to the dollar to 4.025 on December 20, 1994. But this was too little too late, and in the face of continued loss of international reserves, Mexico was forced to let the peso float. The peso then depreciated to 7 pesos to the dollar by March 1995 and reached nearly 8 pesos to the dollar in December 1995.

In order to help Mexico and to prevent the spread of the financial crisis to other emerging markets (particularly Argentina and Brazil), the United States organized an international support package of nearly $48 billion through the IMF in January 1995, which succeeded in calming financial markets and containing the crisis to Mexico. But very high interest rates and deep budget deficit cuts plunged Mexico into a deep recession in 1995. It was only in 1996 that the bottom of the recession was reached and growth resumed in Mexico.

Source: Federal Reserve Bank of Atlanta, "A Predictable and Avoidable Mexican Meltdown," *Economics Update*, December 1996, pp. 1–3.

CASE STUDY 21-3 Chronology of Economic Crises in Emerging Markets: From Asia to Argentina

Table 21.5 presents the chronology of the economic crises in emerging markets from the late 1990s to the present. The economic crises of the 1990s in emerging markets started in Thailand in July 1997. By fall 1997 the crisis had spread to the Philippines, South Korea, Indonesia, and Malaysia; by summer 1998 to Russia; and in January 1999 to Brazil. It also affected China, Taiwan, Hong Kong, and Singapore, as well as Mexico and Argentina and, to some extent, most other developing countries. By the end of 1999, the crisis was more or less over, and growth resumed in most emerging markets, except Indonesia and Russia. In 2001, however, a banking and financial crisis erupted in Turkey, and in 2002, Argentina faced a total financial, economic, and political collapse. Both of these crises, however, were more or less resolved by 2003. In 2008–2009, growth in most emerging markets slowed significantly as a result of the deep recession engulfing most advanced economies (see Case Study 21-5).

TABLE 21.5. Chronology of Economic Crises in Emerging Markets from the Late 1990s

1997	
May 15	Thailand announces capital controls in an effort to ease the pressure on the baht.
July 2	Thailand devalues the baht by 15 to 20 percent.
July 14	The Philippines and Indonesia devalue the peso and the rupiah, respectively.
August 20	Thailand and the IMF agree on a $17 billion financial stabilization package.
October 27	The Dow Jones Industrial Average falls 554 points amid Asian fears.
October 31	Indonesia and the IMF agree on a $23 billion financial support package.
November 7	Financial markets in Argentina, Brazil, Mexico, and Venezuela fall sharply.
November 17	South Korea abandons its defense of the won.
December 3	South Korea and the IMF agree on a $57 billion financial assistance package.
December	The South Korean won and the Indonesian rupiah collapse.
December 30	Foreign banks agree to roll over South Korea's $100 billion short-term debt.
1998	
Early March	The Indonesian economy verges on hyperinflation; rioting erupts. The government subsidizes food imports, violating the IMF program.
April 10	Indonesia signs a new letter of intent with the IMF for a new reform program.
Early May	The economic situation in Indonesia deteriorates; more frequent and larger riots erupt.
May 19	Political upheaval in Indonesia causes markets in Russia to fall sharply amid fears of spreading financial contagion.
May 21	Suharto resigns as president of Indonesia; B. J. Habbie takes over.
May 26	The South Korean stock market hits an 11-year low.
May 27	The Russian Central Bank triples interest rates to 150% to encourage foreign capital to stay.
July 13	Russia and the IMF agree on an emergency $22.6 billion financial stabilization package.
August 17	Russia devalues the ruble and defaults on payments on its short-term debt.
Late September	The New York Federal Reserve Bank coordinates a bailout of Long-Term Capital Management, a hedge fund with some $100 billion in liabilities.
November 13	Brazil negotiates a $41.5 billion IMF/World Bank/multicountry rescue package.

(continued)

CASE STUDY 21-3 (Continued)

TABLE 21.5. *(continued)*

1999	
January 8	Brazil devalues the real by 8 percent in the face of large capital outflows.
January 15	Brazil allows the real to float freely on world markets, and the real declines by 35 percent.
January 27	China denies rumors that it will devalue the yuan; China's growth rate declines.
Late 1999	Financial crises in emerging markets declared over; growth resumes.
2001	
February	Turkey suffers banking crisis and lets the currency (the lira) float.
December	Argentina defaults on its debt (largest in history).
2002	
January	Argentina experiences end of currency board arrangements and devaluation of peso and plunges into financial, economic, and political turmoil; IMF refuses to grant loans without credible plan for economic restructuring.
February 4	Turkey receives IMF loan of $12.8 billion.
August 7	Brazil receives $30 billion grant to help it avoid new financial crisis.
2005	
June	Argentina restructures its foreign debt with about 75 percent of its bondholders.
July	China revalues its currency by 2 percent and breaks its exchange rate peg to the dollar.
November	Brazil pays off its outstanding IMF debt early.
2006	
January	Argentina pays off its outstanding IMF debt early.

Source: Inter-American Development Bank, 1999; updated by the author.

estimated that the cumulative loss of output as a percentage of GDP over the years of the most recent crises was 30 for Mexico, 82 for Indonesia, 57 for Thailand, 39 for Malaysia, and 27 for Korea (there are no estimates for Brazil, Russia, Turkey, or Argentina).

Although the fundamental problem that led to these crises was different, the process was very similar. Each crisis started as a result of a massive withdrawal of short-term liquid funds at the first sign of financial weakness in the nation. Foreign investors poured funds into many emerging markets during the early 1990s after these nations liberalized their capital markets in order to take advantage of high returns and in order to diversify their portfolios, but immediately withdrew their funds on a massive scale at the first sign of economic trouble in the nation—thereby precipitating a crisis. The danger for the international monetary system is that such crises could spread to the rest of the world, including advanced countries.

The heavy currency devaluation that usually accompanies a financial crisis leads to a further serious economic harm to a developing country. This is due to the fact that developing countries, as opposed to advanced ones, are usually forced to borrow in terms of a major foreign currency (the dollar, euro, or yen) because lenders worry (based on past experience) about being repaid with a devalued currency of the nation. Thus, when a developing country's currency is devalued, the domestic-currency value of its debt increases by the percent of the devaluation (i.e., there is transfer of wealth to foreign lenders). The inability of a developing country to borrow in its own currency was called the original sin by *Eichengreen and Hausmann* (1999)—and the name stuck. In recent years, some habitual past "sinners," such as Mexico and Brazil, have been able to borrow in their own currency. Still, many private borrowers in developing countries continue to borrow in dollars and thus would face a problem if the nation's currency is devalued or depreciates.

A number of measures have been proposed, and some steps have already been taken to avoid or minimize such crises in the future and thus greatly strengthen the *architecture of the present international monetary system* and improve its functioning. These include (1) increasing transparency in international monetary relations, (2) strengthening banking and financial systems, and (3) promoting greater private-sector involvement.

Increased transparency is essential because markets cannot work efficiently without adequate, reliable, and timely information. To this end, the IMF established the *Special Data Dissemination Standards (SDDS)* in 1996 and the *General Data Dissemination System (GDDS)* in 1997 (enhanced in 2001 by the *Data Quality Assessment Framework*). These *early-warning financial indicators*, such as the budget and current account deficit, long-term and short-term foreign debts, and international reserves as percentages of GDP, could signal which emerging country or countries might be heading for trouble. The hope is that foreign investors would take note of the potential problem and avoid pouring excessive funds into the nation or nations, thus possibly avoiding a crisis.

The second way of improving the architecture of the present international monetary system is by strengthening emerging markets' banking and financial systems. Weakness in the banking systems was common to all emerging markets that were involved in financial crises during the past decade. A weak banking and financial system invites a financial crisis and guarantees its severity. The banking and financial system can be strengthened by improving supervision and prudential standards, and making sure that banks meet capital requirements, make adequate provisions for bad loans, and publish relevant and timely information on their loan activity. It is also important to deal with insolvent institutions promptly and effectively. Implementing these policies is difficult, especially when a nation's banking and financial system is already in trouble, but a sound financial system is essential for the health and growth of the entire economy. The IMF has been formulating standards or codes of good practice in accounting, auditing, corporate governance, payments and settlements systems, insurance, and banking, and some of these are already being implemented as part of the IMF surveillance function.

The third way of strengthening the present international monetary system is to get much greater private-sector involvement in resolving a financial crisis in emerging markets by rolling over and renegotiating loans or providing new money rather than rushing for the exit, as a precondition for IMF official assistance. The logic is that lenders should be compelled to take some responsibility for the crisis by having lent too much short-term funds to an emerging market for nonproductive purposes. That is, lenders should be "bailed in" rather than be allowed to bail out and rush for the exit door. To this end, the IMF has proposed the creation of a *Sovereign Debt Restructuring Mechanism (SDRM)* for quickly returning an emerging market economy facing a financial problem to sustainability.

Financial crises are not confined to emerging markets, however. In 2008–2009, the United States and most other advanced nations faced a serious financial and economic crisis (see Case Study 21-4). It was at this time that the Group of Twenty (G-20) economies "seized power" and essentially replaced the G-7 (or G-8, which includes Russia) as the steering

CASE STUDY 21-4 The Financial Crisis in the United States and Other Advanced Economies

The U.S. subprime mortgage crisis started in the United States in 2007 and from there it spread to the rest of the financial sector and the real economy of the United States and the world in 2008. This was the first global financial crisis of the twenty-first century and the most serious financial crisis in a generation. The losses from the crisis have been estimated in the trillions of dollars in the United States alone.

Subprime mortgages are housing loans issued to borrowers facing a high risk of being unable to meet their mortgage payments. Many of these subprime mortgages were made at variable rates in 2003 and 2004 when the U.S. lending rate was the lowest in 50 years and led to a serious housing bubble (home prices rising very rapidly and excessively). When the Fed started to increase interest rates in June 2004 to fight inflationary pressures, many subprime borrowers defaulted on their mortgages, housing prices fell, and financial institutions faced huge losses, write-downs, and failures. Troubles in the U.S. housing market then brought to light other questionable and downright fraudulent financial activities and led to a system-wide financial crisis. The financial crisis was thus caused by deregulation or inadequate regulations of the financial activities of investment banks, by the inadequate application of regulations that were already on the books (i.e., rating agencies and the SEC not doing their job), by unfortunate economic policies (granting home mortgages to people who could not afford them), by outright fraud (such as Madoff's incredible $65 billion Ponzi scheme), and by economic greed (CEOs and financial firms caught in a gigantic profit-seeking scheme regardless of risk).

The result was that banks stopped making loans, consumers reduced spending, and what started as a purely financial crisis spilled to the real sector of the economy, plunging the United States into deep recession (which officially started in December 2007) despite trillions of dollars spent by the U.S. government to refinance and rescue banks and on the stimulus packages. More or less the same thing occurred in other advanced countries, which also fell into deep recession in 2008. In our highly globalized and interdependent world, recession in advanced countries then sharply reduced growth in emerging markets.

Some people blame the operation of the international monetary system for the present financial crisis. But the present crisis has a domestic origin and a better working international monetary system would not have led to contagion in other advanced countries if they had not faced the same financial excesses that occurred in the United States. In the medium term, the United States needs to save more and learn to live within its means. Some adjustment seems to have started with the U.S. savings rate rising since 2008. By 2010, growth had resumed in most countries, but growth remained slow.

Source: D. Salvatore, "The Global Financial Crisis: Predictions, Causes, Effects, Policies, Reforms and Prospects," *Journal of Economic Asymmetries*, December 2010, pp. 1–20.

committee of the world economy. In 2009, the G-20 included the finance ministers and central bank governors of the following 19 countries: Argentina, Australia, Brazil, Canada, China, France, Germany, India, Indonesia, Italy, Japan, Mexico, Russia, Saudi Arabia, South Africa, South Korea, Turkey, the United Kingdom, and the United States. The twentieth member was the European Union, which is represented by the rotating Council presidency and the European Central Bank. In addition to these 20 members, the following forums and institutions, as represented by their respective chief executive officers, participate in meetings of the G-20: International Monetary Fund (IMF), World Bank (WB), International

Monetary and Financial Committee (MFC), and Development Committee (DC) of the IMF and World Bank. The G-20 met in London in April 2009 to propose policies to overcome the deep financial and economic crisis and push for reforms to prevent future crises based on (1) strengthening financial supervision and regulation, (2) fostering international policy coordination, (3) reforming the IMF, and (4) maintaining open markets. Other meetings followed aimed primarily at reforming the international financial system and providing a new direction for the world economy, but to date (2012), not many concrete steps have been taken to attain these goals.

21.6F Other Current International Economic Problems

The problems arising from the present exchange rate arrangements and from the global financial and economic crises that we've discussed are closely related to other serious economic problems facing the world today: (1) slow growth and high unemployment in advanced economies after the "great recession"; (2) trade protectionism in advanced countries in the context of a rapidly globalizing world; (3) large structural imbalances in the United States, slow growth in Europe and Japan, and insufficient restructuring in transition economies of Central and Eastern Europe; (4) deep poverty in many developing economies; and (5) resource scarcity, environmental degradation, and climate change that endanger growth and sustainable world development. This section suggests possible solutions to these interrelated problems at which we can arrive after the study of international economics.

1. *Slow Growth and High Unemployment in Advanced Economies after the Great Recession*

In 2010 and 2011, advanced economies experienced slow growth and high unemployment as they came out of the most serious financial and economic crisis since the Great Depression of 1929. The United States and other advanced nations responded by rescuing banks and other financial institutions from bankruptcy, slashing interest rates, and introducing huge economic stimulus packages. These efforts, however, only succeeded in preventing the economic recession from being deeper than otherwise. Even though the recession was officially over in 2010, slow growth and high unemployment remain the most serious economic problems facing most advanced nations today. These problems are even greater for Greece, Ireland, Portugal, Spain, and Italy (all members of the 17-nation European Monetary Union), which remain in deep crisis from overborrowing, unsustainable budget deficits, and loss of international competitiveness.

Advanced economies could try to stimulate growth and reduce unemployment with additional expansionary fiscal and monetary policies, but with already large and unsustainable budget deficits and huge amounts of excess liquidity already in the system, these policies may be ineffective and could even backfire. Larger budget deficits could discourage private consumption because consumers anticipate paying higher taxes in the future to pay for the higher budget deficits. Similarly, by adding more liquidity when so much is already in the system may not stimulate investments and growth and only pose greater inflationary pressures in the future. To increase growth it may be more promising to further restructure the economy and improve education and infrastructures. But these policies take years to bear fruit, are difficult to implement in times of slow growth, and require additional expenditures at a time when most nations face already high and unsustainable budget deficits.

2. *Trade Protectionism in Advanced Countries in the Context of a Rapidly Globalizing World*
   We have seen in Section 9.3 that since the mid-1970s, there has been a rapid proliferation of nontariff trade barriers (NTBs) to the point where they now represent the most serious threat to the postwar trading system and the world's welfare. By interfering with the flow of international trade, rising protectionism leads to a misallocation of resources internationally, a slowdown in structural adjustments in mature economies and growth in developing economies, and it raises the specter of trade wars. The problem has been rendered more complex by the breakup of the world into three major trading blocs: the North American Free Trade Agreement (NAFTA, including the United States, Canada, and Mexico); the European bloc or European Union (EU); and a much less defined and looser Asian bloc (see Section 10.6).

   The successful completion of the Uruguay Round in December 1993 went a long way toward reducing or at least putting an end to increased protectionism in the world today. As pointed out in Section 9.7b, however, many serious trade problems remain. Some sectors (such as insurance) were not included in the agreement, agricultural subsidies remain high, patent protection for pharmaceuticals is disappointing, and trade in computer chips is still subject to tariffs. Although tightened, antidumping action and safeguards are still possible, and so the potential for serious trade disputes remains. These problems were to be addressed in a new round of multilateral trade negotiations (the Doha Round) launched in November 2011 in Doha, Qatar (which, however, all but failed). Regional trade agreements are no substitute for true multilateralism.

   Technological change, globalization, and increased competition from the manufactured exports of emerging economies, especially China, are held responsible for widespread firm downsizing, job insecurity, and stagnant wages in the United States and other advanced countries. The solution to these problems is not to restrict trade and reduce international competition but to increase job training and create a labor force more skilled and prepared for the new information-age jobs that open up in telecommunications, computers, biomedical, and other high-tech fields. But this requires that workers in the United States and other advanced economies continuously upgrade their skills to meet the needs of the new high-tech jobs that open up, that they are willing to move to where the jobs are created, and accept more skilled immigrants will the United States and other advanced economies remain internationally competitive. This is the price that workers in rich countries have to pay for the higher productivity, wages, and standards of living that the "new economy" brings.

3. *Structural Imbalances in Advanced Economies and Insufficient Restructuring in Transition Economies*
   Today, many advanced economies face deep structural problems that hamper their growth. The United States faces deep structural imbalances in the form of excessive spending and inadequate national saving. This means that the United States is living beyond its means by borrowing excessively abroad. The result is huge and unsustainable trade deficits, a depreciated dollar, and unstable financial conditions (see Case Study 21-5). Being such a huge economy, U.S. economic problems quickly become global economic problems in our interdependent world. The United States needs to cut its spending deeply and sharply increase its savings rate in order to overcome its serious structural imbalance. While this cannot be easily or quickly accomplished, the United States does not seem to be trying sufficiently hard to resolve its problems.

CASE STUDY 21-5 Trade Imbalances of the Leading Industrial Nations

One of the most serious global imbalances facing the world economy today is the large and chronic trade deficits of the United States and the United Kingdom and surplus of Germany (among advanced nations). Table 21.6 shows that the U.S. trade deficit increased from $25.5 billion in 1980 to $110.3 billion in 1990, $443.9 billion in 2000, to a high of $832.9 billion in 2006 (not shown in the table), and it was $735.2 billion in 2011. Germany's trade surplus rose from $2.1 billion in 1960 to the all-time high of $273.5 billion in 2007 (not shown in the table), and it was $214.6 billion in 2011. In 2011, Japan, the United Kingdom, France, and Italy had trade deficits, respectively, of $20.6 billion, $159.8 billion, $102.3 billion, and $24.7 billion, while Canada had nearly balanced balance.

The U.S. dollar appreciated by nearly 40 percent on a trade-weighted basis from 1981 to 1985, but then depreciated even more from 1985 to 1988, but the U.S. trade deficit started to decline only in 1988. Despite record trade deficits, the U.S. dollar appreciated sharply from 1995 until 2000 because rapid growth attracted huge amounts of foreign capital to the United States. The U.S. trade deficit continued to increase until 2006 even though the dollar started to depreciate in mid-2005. The current U.S. trade deficit is unsustainable in the long run as is the large trade surplus of Germany (among advanced nations).

TABLE 21.6. Trade Imbalances of the Leading Industrial Countries, 1960–2011, Selected Years (in billions of U.S. dollars)

Country	1960	1970	1980	1990	1995	2000	2005	2008	2011
United States	4.9	2.6	−25.5	−110.3	−172.3	−443.9	−777.8	−827.1	−735.2
Japan	0.3	4.0	2.1	69.3	131.8	116.7	94.0	38.1	−20.6
Germany	2.1	5.7	7.9	68.5	65.1	56.4	194.9	267.2	214.6
United Kingdom	−1.1	0.0	3.4	−32.5	−19.0	−49.9	−124.7	−173.5	−159.8
France	0.6	0.3	−14.1	−13.3	11.0	−3.2	−27.8	−87.3	−102.3
Italy	−0.6	−0.2	−15.9	−1.5	39.7	9.5	0.6	−2.8	−24.7
Canada	−0.2	3.0	7.9	9.5	25.9	45.0	51.7	43.8	2.2

Sources: International Monetary Fund, *International Financial Statistics Yearbook*, various years; and D. Salvatore, "Global Imbalances," *Princeton Encyclopedia of the World Economy* (Princeton University Press, 2008).

Europe faces a somewhat different structural problem that dampened its growth and led to high unemployment even before the recent global financial crisis. Most European countries have overgenerous social security benefits and inflexible labor markets, which discourage work and job creation in the face of globalization and international competition. With high unemployment, Europe imports less than it would otherwise and tends to restrict trade in the vain effort to protect jobs. Again, we see how in our interdependent world, a national or regional problem quickly becomes a general global problem. The emerging consensus is that solving Europe's unemployment problem requires scaling down social security benefits and eliminating the regulations that hinder labor market flexibility (if it is very difficult to fire workers, employers will think twice before hiring them). But this is more easily said than done, especially since Europeans are justifiably proud of their high wages and comprehensive social-labor.

Japan suffered three recessions and anemic growth from the early 1990s, when the real estate bubble burst and left many banks with huge amounts of noncollectible loans. Banks then stopped making loans, even to deserving businesses, and the nation plunged into economic stagnation. Japan tried almost everything to overcome its problem. It lowered interest rates to practically zero to stimulate private investments, it undertook huge public works to build roads and other infrastructure (often not needed) in order to jump-start and stimulate the economy, and it kept the exchange rate undervalued to stimulate exports. Nevertheless, it wasn't until 2004 that Japan seemed to finally emerge from economic crisis—only to fall back into deep recession during the recent global financial crisis. Japan must cut its excessive budget deficit and national debt, and correct the serious inefficiencies in its distribution system. But, as was pointed put earlier, it is difficult to restructure the economy, eliminate inefficiencies, and cut budgets in the face of slow growth.

Although considerable progress has been made in restructuring and establishing market economies in *transition economies* (the former centrally planned economies of Central and Eastern Europe and the Soviet Unon), the process is far from complete. As pointed out in Section 10.6E, these countries need massive amounts of foreign capital and technology, as well as more liberal access to Western markets, in order to establish full-fledged market economies. Slow growth and high unemployment in Western Europe, however, retarded progress. Ten transition economies (eight in Central and Eastern Europe plus Cyprus and Malta) were admitted into the European Union in 2004, Bulgaria and Romania entered in 2008, and five have formally adopted the euro. These countries are facilitating their process of economic restructuring and integration into the world economy, and closing their large gaps in standard of living with other advanced economies.

4. *Deep Poverty in Many Developing Countries*

Even though many developing countries are now growing very rapidly, many of the poorest developing nations, particularly those in sub-Saharan Africa, face deep poverty, unmanageable international debts, economic stagnation, and widening international inequalities in living standards. These conditions pose serious problems for the world economy. An international economic system that has spread the benefits from international trade and specialization so unevenly can hardly be said to be functioning properly—not to mention equitably. And a world where millions of people starve not only is unacceptable from an ethical point of view but also can hardly be expected to be a peaceful and tranquil world. Chapters 8 and 11 estimated the reasons that international inequalities in standards of living between the rich and the poorest developing countries of the world are so large and widening and suggested what can be done to overcome them.

Over the years, the United Nations Conference on Trade and Development (UNCTAD) and other international forums have advanced many proposals to improve conditions in developing nations and stimulate their development. These proposals lost some of their immediacy during the 1980s and 1990s because developed countries (especially Western Europe, Japan, and the United States) were absorbed with their own domestic problems of monetary and exchange rate instability, slow growth, structural imbalances, and high unemployment. As part of the demands for a New

International Economic Order (NIEO—see Section 11.6C), developing countries have been demanding both greater access for their exports to developed country markets and much greater flow of aid.

The successful completion of the Uruguay Round in December 1993 only partially addressed the trade problems facing developing countries. The foreign aid granted by developed countries has stagnated despite the fact that the problems faced by the poorest developing countries remain oppressively high (see Case Study 11-5). The *Millennium Declaration* in September 2000 set precise objectives incorporating specific targets for reducing income poverty, tackling other sources of human deprivation, and promoting sustainable development by 2015 (see Case Study 11-6). Most important, the Doha Round was to address the trade problem, but, as pointed out earlier, it has all but failed. The hope now is that the Group of Twenty (G-20) will be more successful in addressing the serious trade problems of the poorest developing countries.

5. *Resource Scarcity, Environmental Degradation, Climate Change, and Sustainable Development*
Growth in rich countries and development in poor countries are today threatened by resource scarcity, environmental degradation, and climate change. In the face of rapidly growing demand, particularly by China and India, and supply rigidities in producing nations, the price of petroleum, other raw materials, and food has risen sharply during the past few years. In many emerging market economies, protection of the environment takes a back seat to the growth imperative. Environmental pollution is dramatic in some parts of China, and in South America the Amazon forest is rapidly being destroyed. We are witnessing very dangerous climate changes that may have increasingly dramatic effects on life on Earth in all countries, but especially in the poorest developing ones. These problems, however, can be only adequately analyzed and addressed by a joint effort of all the sciences together, a major worldwide cooperative effort, and a change in world governance.

It is clear from this discussion that the international economic problems facing the world today are closely interrelated. For example, excessive U.S. trade and budget deficits lead to protectionism and dollar depreciation, which affect all countries, developed and developing. They also show the strong links between international trade discussed in the first half of the text (Chapters 2–12) and international finance discussed in the second half (Chapters 13–21).

Despite their seriousness, the world has faced similar, and sometimes even worse, problems in the past. The hope is that the world can tackle the current economic, financial, social, political, and environmental challenges in the spirit of cooperation and mutual understanding.

SUMMARY

1. In this chapter, we examined the operation of the international monetary system from the gold standard period to the present. An international monetary system refers to the rules, customs, instruments, facilities, and organizations for effecting international payments. International monetary systems can be classified according to the way in which exchange rates are determined or according to the form that international reserve assets take. A good international monetary system is one that maximizes the flow of international trade and investments and leads to an equitable distribution of the gains from trade among nations. An international monetary system can be evaluated in terms of adjustment, liquidity, and confidence.

2. The gold standard operated from about 1880 to the outbreak of World War I in 1914. Most of the actual adjustment under the gold standard seems to have taken place through stabilizing short-term capital flows and induced income changes, rather than through induced changes in internal prices, as postulated by the price-specie-flow mechanism. Adjustment was also greatly facilitated by buoyant and stable economic conditions. The period from 1919 to 1924 was characterized by wildly fluctuating exchange rates. Starting in 1925, Britain and other nations attempted to reestablish the gold standard. This attempt failed with the deepening of the Great Depression in 1931. There followed a period of competitive devaluations as each nation tried to "export" its unemployment. This, together with the serious trade restrictions imposed by most nations, cut international trade almost in half.

3. The Bretton Woods system agreed upon in 1944 called for the establishment of the International Monetary Fund (IMF) for the purposes of (1) overseeing that nations followed a set of agreed rules of conduct in international trade and finance and (2) providing borrowing facilities for nations in temporary balance-of-payments difficulties. This was a gold-exchange standard with gold and convertible currencies (only U.S. dollars at the beginning) as international reserves. Exchange rates were allowed to fluctuate by only 1 percent above and below established par values. Par values were to be changed only in cases of fundamental disequilibrium and after approval by the Fund. Each nation was assigned a quota in the Fund, depending on its importance in international trade. A nation had to pay 25 percent of its quota in gold and the remaining 75 percent in its own currency. A nation in balance-of-payments difficulties could borrow 25 percent of its quota from the Fund each year by depositing more of its currency in exchange for convertible currencies, until the Fund held no more than 200 percent of the nation's quota in the nation's currency.

4. Under the Bretton Woods system, industrial nations in fundamental disequilibrium were very reluctant to change par values. The convertibility of the dollar into gold resumed soon after the war, and that of other industrial nations' currencies resumed by the early 1960s. Tariffs on manufactured goods were lowered to an average of less than 10 percent by 1971. Through increased membership and quota increases, the resources of the Fund rose to $28.5 billion by 1971. The Fund also negotiated the General Arrangements to Borrow to further augment its resources. Nations negotiated standby arrangements with the Fund and swap arrangements with other central banks. The IMF also began to allow member nations to borrow up to 50 percent of their quota in any one year. In 1967 the IMF decided to create $9.5 billion of Special Drawing Rights (distributed in 1970–1972) to supplement international reserves. In 1961 the gold pool was set up, but it collapsed in 1968 and the two-tier system was established. During the Bretton Woods period, the European Union and the Eurocurrency markets came into existence, world output grew rapidly, and international trade grew even faster.

5. Use of the dollar as the principal international currency conferred the benefit of seigniorage on the United States, but the United States could not devalue to correct balance-of-payments deficits and its monetary policy was seriously constrained. The immediate cause of the collapse of the Bretton Woods system was the huge balance-of-payments deficit of the United States in 1970 and the expectation of an even larger deficit in 1971. This led to massive destabilizing speculation against the dollar, suspension of the convertibility of the dollar into gold on August 15, 1971, and a realignment of currencies in December 1971. The fundamental cause of the collapse of the Bretton Woods system is to be found in the lack of an adequate adjustment mechanism. The persistence of U.S. balance-of-payments deficits provided for the system's liquidity but also led to loss of confidence in the dollar. The dollar was devalued again in February 1973. In March 1973, in the face of continued speculation against the dollar, the major currencies were allowed to fluctuate either independently or jointly.

6. Since March 1973, the world has operated under a managed float (formally recognized in the Jamaica Accords, which took effect in April 1978). In March 1979, the European Monetary System was formed, in October 1988, the European Central Bank was created, the euro was introduced on January 1, 1999, and

began circulating on January 1, 2002, as the single currency of the European Monetary Union. Borrowing at the IMF has been relaxed, and significant new credit facilities have been created. The most significant monetary problems facing the world today are the excessive fluctuations and large misalignments in exchange rates. Target zones and greater international macroeconomic policy coordination have been advocated to overcome them. During the past decade, there were a series of financial and economic crises in Mexico, Southeast Asia, Russia, Brazil, Turkey, and Argentina, and in 2008–2009 in the United States and most other advanced economies. Proposed solutions by the G-20 include strengthening financial supervision and regulation, fostering international policy coordination, reforming the IMF, and maintaining open markets. Other serious international economic problems are (1) slow growth and high unemployment in advanced economies after the "great recession," (2) trade protectionism in advanced countries in the context of a rapidly globalizing world, (3) large structural imbalances in the United States, slow growth in Europe and Japan, and insufficient restructuring in transition economies of Central and Eastern Europe, (4) deep poverty in many developing economies, and (5) resource scarcity, environmental degradation, and climate change that endanger growth and sustainable world development.

KEY TERMS

Adjustment, p. 688
Benign neglect, p. 702
Bretton Woods system, p. 692
Confidence, p. 688
Credit tranches, p. 693
Currency convertibility, p. 692
Dollar glut, p. 701
Dollar overhang, p. 707
Dollar shortage, p. 698
Dollar standard, p. 700
First-credit tranche, p. 703
Fundamental disequilibrium, p. 692
General Arrangements to Borrow (GAB), p. 695
Gold tranche, p. 693
Group of Twenty (G-20), p. 712
IMF conditionality, p. 704
International Bank for Reconstruction and Development (IBRD or World Bank), p. 693
International Development Association, p. 693
International Finance Corporation (IFC), p. 693
International Monetary Fund (IMF), p. 692
International monetary system, p. 687
Intervention currency, p. 692
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Substitution account, p. 707
Super gold tranche, p. 694
Swap arrangements, p. 696

QUESTIONS FOR REVIEW

1. What is meant by an international monetary system? How can international monetary systems be classified?

2. What are the characteristics of a good international monetary system? How can an international monetary system be evaluated?

3. How was adjustment to balance-of-payments disequilibria under the gold standard explained by Hume? How did adjustment actually take place under the gold standard?

4. What type of international monetary system operated from 1920 to 1924? What happened between 1925 and 1931? What happened after 1931?

5. What are the two basic functions of the International Monetary Fund?

6. What is meant by the Bretton Woods system being a gold-exchange standard? How were exchange rates determined under the Bretton Woods system? Under what conditions were nations allowed to change their exchange rates?

7. What was the procedure for nations to borrow from the IMF?

8. In what way did the Bretton Woods system operate as intended? In what way did it not? How did the Bretton Woods system evolve over the years?

9. What is meant by the General Arrangements to Borrow? standby arrangements? swap arrangements? Special Drawing Rights? gold pool? two-tier gold market?

10. What was meant by the dollar shortage? dollar glut? What were Roosa bonds? What was the purpose of the Interest Equalization Tax and the Foreign Direct Investment Program?

11. What is meant by seigniorage?

12. What was the Smithsonian Agreement? What is meant by the European snake? the dollar standard? adjustment, liquidity, confidence?

13. What was agreed on at the Jamaica Accords?

14. How is the value of the SDR determined today? What additional credit facilities have been set up by the IMF?

15. What are the major problems facing the world today? What is being proposed to solve them?

PROBLEMS

***1.** Explain:

(a) How economic conditions today differ from those prevailing under the gold standard period.

(b) Why the different economic conditions today would make the reestablishment of a smoothly working gold standard impossible.

2. With respect to a nation with a $100 million quota in the IMF, indicate how the nation was to pay in its quota to the IMF and the amount that the nation could borrow in any one year under the original rules. How are the rules different today?

3. Explain the procedure whereby the nation of Problem 2 borrowed the maximum amount allowed from the IMF for the first year under the original rules.

4. Explain the procedure whereby the nation of Problem 2 borrowed the maximum amount allowed from the IMF in each year after it had already borrowed the maximum amount allowed in the first year under the original rules.

5. With regard to the nation of Problem 2, explain how and when the nation was to repay its loan to the IMF under the original rules.

*= Answer provided at www.wiley.com/college/salvatore.

6. Explain what happens if the nation of Problem 2 (call it Nation A) stops borrowing after the first year, but before it repays its loan, another nation borrows $10 of Nation A's currency from the IMF.

***7.** **(a)** Explain how a nation could attempt to discourage large destabilizing international capital inflows under the Bretton Woods system by intervening in the *forward* market.

(b) Can the same be done under the present international monetary system?

***8.** **(a)** Explain how a nation could attempt to discourage large destabilizing international capital inflows under the Bretton Woods system by intervening in the *spot* market.

(b) Can the same be done under the present international monetary system?

9. Explain the role of the dollar under the Bretton Woods system.

10. Explain with respect to the Bretton Woods system:

(a) The immediate cause of its collapse.

(b) The fundamental cause of its collapse.

11. Explain briefly the operation of the present international monetary system.

12. **(a)** Explain the fundamental reason for the Mexican currency crisis of December 1994.

(b) How does the International Monetary Fund propose to avoid the recurrence of similar crises in the future?

13. With regard to the Mexican crisis of December 1994, indicate the lesson that it provides (a) for developing countries relying heavily on short-term capital inflows and (b) on how to deal with a currency crisis once it starts.

14. **(a)** Explain the fundamental causes of the economic crises in emerging markets in the second half of the 1990s.

(b) What is being proposed to avoid similar crises in the future?

15. Identify the most significant international economic problems facing the world today.

APPENDIX

A21.1 International Reserves: 1950–2011

In this appendix, we present historical data on the amount of international reserves in terms of SDRs, as reported by the IMF. The IMF includes gold reserves only at the official price of SDR 35 an ounce. Table 21.7 includes gold reserves at SDR market prices. The table also reports the dollar value of one SDR at year end. A few of the totals in the table are subject to very small rounding errors. The SDR market price of gold was practically identical to the official price of SDR 35 per ounce until the two-tier gold market was established in 1968. Note the sharp increase in foreign exchange reserves (mostly dollars) and gold reserves at market prices since the breakdown of the Bretton Woods system in 1971. The decline in SDR reserves in 1992 was due to many IMF members using SDRs to pay for quota increases at the IMF.

Problem (a) Calculate the ratio of the total dollar value of international reserves (with gold measured at market values) to the total dollar value of world imports in 1950, 1955, 1965, 1970, 1980, 1985, 1990, 1995, 2000, 2005, and from 2008–2011. (b) What can you say about the change in international liquidity over the years? (c) Why may international liquidity be excessive under the present international monetary system?

TABLE 21.7. International Reserves, 1950–2011 (billions of SDRs, at year end)

		1950	1955	1960	1965	1966	1967	1968	1969
1.	Foreign exchange	13.3	16.7	18.5	24.0	25.7	29.4	32.6	32.9
2.	SDRs	—	—	—	—	—	—	—	—
3.	Reserve position in the Fund	1.7	1.9	3.6	5.4	6.3	5.7	6.5	6.7
4.	Total reserves minus gold	15.0	18.6	22.1	29.4	32.0	35.2	39.1	39.8
5.	Gold at SDR 35/ounce	32.2	35.0	37.9	41.8	40.8	39.6	38.7	38.9
6.	Total with gold at SDR 35/ounce	48.2	53.6	60.0	71.2	72.8	74.6	77.8	78.7
7.	Gold at SDR market price	33.0	35.0	38.6	41.9	41.1	39.4	46.4	45.7
8.	Total with gold at market price in SDRs	48.0	53.6	60.7	71.3	73.1	74.8	85.5	79.0
9.	U.S. dollars per SDR	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000

(continued)

TABLE 21.7. *(continued)*

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981
1.	45.1	74.6	95.7	101.8	126.2	137.3	160.2	202.3	222.5	248.6	292.6	291.9
2.	3.1	5.9	8.7	8.8	8.9	8.8	8.7	8.1	8.1	12.5	11.8	16.4
3.	7.7	6.4	6.3	6.2	8.8	12.6	17.7	18.1	14.8	11.8	16.8	21.3
4.	56.2	87.1	110.9	116.8	144.0	158.7	186.6	228.5	245.5	272.9	321.3	329.7
5.	37.0	36.0	35.8	35.9	35.8	35.7	35.5	36.0	36.3	33.1	33.5	33.5
6.	93.2	123.1	146.7	152.7	179.8	194.4	222.2	264.5	281.8	306.0	354.7	363.1
7.	39.6	38.7	52.9	82.6	133.0	140.3	109.1	125.3	154.0	220.5	455.4	406.8
8.	95.8	125.8	163.8	199.4	277.0	299.0	295.7	353.8	399.5	493.8	776.6	736.4
9.	1.0000	1.0857	1.0857	1.2064	1.2244	1.1707	1.1618	1.2417	1.3028	1.3173	1.2754	1.1640

	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
1.	284.7	308.8	349.1	347.9	363.8	455.9	494.4	545.1	611.3	646.2	673.3	750.3
2.	17.7	14.4	16.5	18.2	19.5	20.2	20.2	20.5	20.4	20.6	12.9	14.6
3.	25.5	39.1	41.6	38.7	35.3	31.5	28.3	25.5	23.7	25.9	33.9	32.8
4.	327.9	362.3	407.1	404.9	418.7	507.6	542.8	591.1	655.4	692.6	720.1	797.7
5.	33.4	33.3	33.3	33.4	33.3	33.1	33.1	32.9	32.9	32.9	32.5	32.2
6.	361.2	395.6	440.3	438.2	452.0	540.8	576.0	624.0	688.3	725.5	752.6	829.9
7.	324.1	383.4	348.9	274.8	286.0	297.7	307.5	273.0	253.1	237.5	231.6	241.4
8.	652.0	745.7	756.1	679.6	704.6	805.3	850.3	864.0	908.3	929.8	951.7	1,039.0
9.	1.1031	1.0470	0.9802	1.0984	1.2232	1.4187	1.3457	1.3142	1.4227	1.4304	1.3750	1.3736

	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
1.	812.8	934.9	1,089.2	1,197.9	1,167.6	1,298.3	1,485.8	1,630.6	1,770.9	2,035.5	2,413.4	3,022.5
2.	15.8	19.8	18.5	20.5	20.4	21.5	21.5	21.5	21.5	21.5	21.5	21.5
3.	31.7	36.7	38.0	47.1	60.6	54.8	47.4	56.9	66.1	66.5	55.8	28.6
4.	860.3	991.3	1,145.8	1,265.5	1,248.6	1,371.6	1,551.7	1,707.1	1,856.8	2,122.1	2,489.6	3,071.3
5.	32.0	31.8	31.8	31.2	33.9	37.7*	37.3	37.0	36.6	36.0	35.4	34.7
6.	890.4	1,020.1	1,177.6	1,296.7	1,282.5	1,409.3	1,589.0	1,744.1	1,893.4	2,158.1	2,525.0	3,106.0
7.	240.4	236.1	245.2	218.9	202.3	219.1	228.4	228.0	238.3	251.3	266.3	308.6
8.	1,100.7	1,227.4	1,391.0	1,484.4	1,450.9	1,590.7	1,817.4	1,972.1	2,131.7	2,409.4	2,791.3	3,414.6
9.	1.4599	1.4865	1.4380	1.3493	1.4080	1.3725	1.3029	1.2567	1.3595	1.4860	1.5530	1.4293

	2006	2007	2008	2009	2010	2011
1.	3,491.8	4,242.6	4,769.2	5,207.8	6,014.9	6,644.1
2.	21.5	21.5	21.4	204.0	204.1	204.1
3.	17.5	13.7	25.1	38.7	48.8	98.3
4.	3,527.9	4,275.1	4,813.4	5,447.2	6,263.4	6,935.6
5.	34.3	33.7	33.7	34.3	34.7	35.1
6.	3,562.2	4,308.8	4,847.1	5,481.5	6,298.1	6,970.7
7.	393.5	424.8	545.6	608.8	788.3	1,024.8
8.	3,955.7	4,733.6	5,392.7	6,090.3	7,086.4	7,995.5
9.	1.5044	1.5803	1.5403	1.5677	1.5400	1.5353

*The IMF recalculated amount of its gold holdings.

Source: International Monetary Fund, *International Financial Statistics* (Washington, D.C.: IMF, 1985, 1998, 2002, and 2012).

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INTERNet

Data and analyses of the operation of the present international monetary and trading systems are regularly conducted by the International Monetary Fund (IMF), the Organization for Economic Cooperation and Development (OECD), the Bank for International Settlements (BIS), the World Trade Organization (WTO), and the World Bank (WB). Many of these are posted on their web sites at:

http://www.imf.org

http://www.oecd.org

http://www.bis.org

http://www.wto.org

http://www.worldbank.org

For historical exchange rate, interest rate, and price of gold data during the gold standard, see:

http://www.nber.org/databases/macrohistory/contents/index.html

For the operation of the international monetary system and International Monetary Fund, as well as proposals for reforms of the international monetary system, see:

http://www.imf.org/external/pubs/ft/weo/2011/01/index.htm

To compare price discipline under fixed and flexible exchange rate systems, examine historical CPI data for various countries at:

http://www.economagic.com/blsint.htm

For the Special Drawing Rights (SDR) "valuation basket: percentage weights," see:

http://www.imf.org/external/np/exr/facts/sdr.htm

GDP and trade data are found at:

http://www.worldbank.org

http://www.wto.org

Financial data on emerging markets and their crises are found at:

http://www.worldbank.org

http://www.emgmkts.com

http://www.roubini.com

Glossary of Key Terms

A

Absolute advantage The greater efficiency that one nation may have over another in the production of a commodity. This was the basis for trade for Adam Smith.

Absolute purchasing-power parity theory Postulates that the equilibrium exchange rate is equal to the ratio of the price levels in the two nations. This version of the PPP theory can be very misleading.

Absorption approach Examines and integrates the effect of induced income changes in the process of correcting a balance-of-payments disequilibrium by a change in the exchange rate.

Accommodating transactions Transactions in official reserve assets required to balance international transactions; also called below-the-line items.

Ad valorem tariff A tariff expressed as a fixed *percentage* of the value of a traded commodity.

Adjustable peg system The system under which exchange rates or par values are periodically changed to correct balance-of-payments disequilibria.

Adjustment The process by which balance-of-payments disequilibria are corrected.

Adjustment in the balance of payments The operation and effects of the mechanisms for correcting balance-of-payments disequilibria.

Adjustment policies Specific measures adopted by a nation's monetary authorities for the primary purpose of correcting a balance-of-payments disequilibrium.

Aggregate demand (AD) curve The graphical relationship between the total quantity demanded of goods and services at various prices.

Aggregate supply (AS) curve The graphical relationship between the nation's output and the price level over a given time period.

Antiglobalization movement The loose organization that blames globalization for many human and environmental problems throughout the world and for sacrificing human and environmental well-being to the corporate profits of multinationals (Sect. 9.7B).

Antitrade production and consumption Increases in production and consumption that lead to a smaller than proportionate increase (or even an absolute decline) in the volume of trade.

Appreciation A decrease in the domestic currency price of the foreign currency.

Arbitrage The purchase of a currency in the monetary center where it is cheaper for immediate resale in the monetary center where it is more expensive in order to make a profit.

Autarky The absence of trade, or isolation.

Autonomous transactions International transactions that take place for business or profit motives (except for unilateral transfers) and independently of balance-of-payments considerations; also called above-the-line items.

Average propensity to import (APM) The ratio of imports to national income, or M/Y.

B

Balance of payments A summary statement of all the international transactions of the residents of a nation with the rest of the world during a particular period of time, usually a year.

Balanced growth Equal rates of factor growth and technological progress in the production of both commodities.

Balassa-Samuelson effect The higher ratio in the price of nontraded goods and services to the price of traded goods in developed rather than in developing nations, and overvalued exchange rates in the former relative to the latter.

Baltic Free Trade Agreement (BAFTA) The agreement among the Baltic States of Estonia, Latvia, and Lithuania setting up a free trade area among themselves.

Basis for trade The forces that give rise to trade between two nations. This was absolute advantage according to Adam Smith and comparative advantage according to David Ricardo.

Benign neglect The policy of nonintervention in foreign exchange markets followed by the United States from March 1973 until the end of 1977 and from 1981 to 1985.

Bilateral agreements Agreements between two nations regarding quantities and terms of specific trade transactions.

Bilateral trade Trade between any two nations.

***BP* curve** The usually positively inclined curve showing the various combinations of interest rates and national income levels at which the nation's balance of payments is in equilibrium.

Brain drain The migration of highly skilled and trained people from developing to developed nations and from other industrial nations to the United States.

Bretton Woods system The gold-exchange standard that operated from the end of World War II until 1971.

Buffer stocks The type of international commodity agreement that involves the purchase of the commodity (to be added to the stock) when the commodity price falls below an agreed minimum price, and the

Buffer stocks sale of the commodity out of the stock when the commodity price rises above the established maximum price.

Bulk purchasing An agreement to purchase a specified amount of a commodity for a year or a number of years.

C

Capital account It includes debt forgiveness and goods and financial assets that migrants take with them as they leave or enter the country.

Capital-intensive commodity The commodity with the higher capital-labor ratio at all relative factor prices.

Capital-labor ratio (*K/L*) The amount of capital per unit of labor used in the production of a commodity.

Capital-saving technical progress Technical progress that increases the productivity of labor proportionately more than the productivity of capital and results in an increase in L/K at constant relative factor prices.

Carry trade The strategy in which an investor borrows low-yielding currencies and lends (invests in) high-yielding currencies.

Central and Eastern European Countries (CEEC) Includes Albania, Bosnia and Herzegovina, Bulgaria, Croatia, the Czech Republic, the Federal Republic of Yugoslavia, Hungary, the former Yugoslav Republic (FYR), Macedonia, Poland, Romania, the Slovak Republic, and Slovenia.

Central European Free Trade Association (CEFTA) The agreement signed by Poland, Hungary, the Czech Republic, and Slovakia in 1992 calling for the establishment of free trade among its members within ten years (subsequently anticipated for 1997).

Centralized cartel An organization of suppliers of a commodity that behaves as a monopolist.

Centrally planned economies Economies in which factors of production are owned by the government and prices are determined by government directives.

Closed economy An economy in autarky or not engaging in international transactions.

Cobb-Douglas production function The production function exhibiting a unitary elasticity of substitution between labor and capital.

Commercial policies The regulations governing a nation's commerce or international trade.

Commodity, or net barter, terms of trade The ratio of the price index of the nation's exports to the price index of its imports times 100.

Common market Removes all barriers on trade among members, harmonizes trade policies toward the rest of the world, and also allows the free movement of labor and capital among member nations. An example is the European Union (EU) since January 1, 1993.

Commonwealth of Independent States (CIS) The organization formed by most of the former Soviet Republics when the Soviet Union was dissolved at the end of 1991.

Community indifference curve The curve that shows the various combinations of two commodities yielding equal satisfaction to the community or nation. Community indifference curves are negatively sloped, convex from the origin, and should not cross.

Comparative statics Studies and compares two or more equilibrium positions (resulting from changes in underlying economic conditions) without regard to the transitional period and process of adjustment.

Complete specialization The utilization of all of a nation's resources in the production of only one commodity with trade. This usually occurs under constant costs.

Compound tariff A combination of an ad valorem and a specific tariff.

Confidence The knowledge that the balance-of-payments adjustment mechanism is working adequately and that international reserves will retain their absolute and relative values.

Constant elasticity of substitution (CES) production function The production function exhibiting a constant (but not necessarily unitary) elasticity of substitution between labor and capital.

Constant opportunity costs The constant amount of a commodity that must be given up to produce each additional unit of another commodity.

Constant returns to scale The condition under which output grows in the same proportion as factor inputs.

Consumer surplus The difference between what consumers are willing to pay for a specific amount of a commodity and what they actually pay for it.

Consumption effect of a tariff The reduction in domestic consumption of a commodity resulting from the increase in its price due to a tariff.

Consumption function The relationship between consumption expenditures and income. In general, consumption is positive when income is zero (i.e., the nation dissaves) and rises as income rises, but by less than the rise in income.

Council of Mutual Economic Assistance (CMEA or COMECON) The organization of Communist bloc nations formed by the Soviet Union in 1949 to divert trade from Western nations and achieve a greater degree of self-sufficiency among Communist nations.

Countervailing duties (CVDs) Tariffs imposed on imports to offset subsidies by foreign governments.

Covered interest arbitrage The transfer of short-term liquid funds abroad to earn higher returns with the foreign exchange risk covered by the spot purchase of the foreign currency and a simultaneous offsetting forward sale.

Covered interest arbitrage margin (CIAM) The interest differential in favor of the foreign monetary center minus the forward discount on the foreign currency, or the interest differential in favor of the home monetary center minus the forward premium on the foreign currency.

Covered interest arbitrage parity (CIAP) The situation where the interest differential in favor of the foreign monetary center equals the forward discount on the foreign currency.

Crawling peg system The system under which par values or exchange rates are changed by very small preannounced amounts at frequent and clearly specified intervals until the equilibrium exchange rate is reached.

Credit tranche The amounts that a member nation could borrow from the IMF, subject to conditions, over and above the gold tranche.

Credit transactions Transactions that involve the receipt of payments from foreigners. These include the export of goods and services, unilateral transfers from foreigners, and capital inflows.

Cross-exchange rate The exchange rate between currency A and currency B, given the exchange rate of currency A and currency B with respect to currency C.

Currency board arrangements (CBAs) The exchange rate arrangement whereby the nation rigidly fixes the exchange rate and its central bank loses its ability to conduct an independent monetary policy by allowing the nation's supply to increase or decrease only in response to balance-of-payments surpluses or deficits.

Currency convertibility The ability to exchange one national currency for another without any restriction or limitation.

Current account The account that includes all sales and purchases of currently produced goods and services, income on foreign investments, and unilateral transfers.

Customs union Removes all barriers on trade among members and harmonizes trade policies toward the rest of the world. The best example is the European Union (EU).

D

Debit transactions Transactions that involve payments to foreigners. These include the import of goods and services, unilateral transfers to foreigners, and capital outflows.

Deficit in the balance of payments The excess of debits over credits in the current and capital accounts, or autonomous transactions; equal to the net *credit* balance in the official reserve account, or accommodating transactions.

Deindustrialization The decline in the relative importance of manufacturing and in the share of manufacturing employment.

Demand for money According to the monetary approach, the nation's demand for nominal money balances is stable in the long run and is directly related to nominal national income but inversely related to the rate of interest in the nation.

Depreciation An increase in the domestic currency price of the foreign currency.

Derived demand The demand for factors of production that arises from the demand for final commodities that are produced using the particular factors.

Desired or planned investment The level of investment expenditures that business would like to undertake.

Destabilizing speculation The sale of a foreign currency when the exchange rate falls or is low, in the expectation that it will fall even lower in the future, or the purchase of a foreign currency when the exchange rate is rising or is high, in the expectation that it will rise even higher in the future.

Devaluation A deliberate (policy) increase in the exchange rate by a nation's monetary authorities from one fixed or pegged level to another.

Differentiated products The somewhat different products (such as automobiles, cigarettes, and soaps) produced by different manufacturers in the same industry or general product group.

Direct controls Tariffs, quotas, and other restrictions on the flow of international trade and capital.

Direct investments Real investments in factories, capital goods, land, and inventories where both capital and management are involved and the investor retains control over the use of the invested capital.

Dirty floating Managing the nation's exchange rate to achieve aims other than simply the smoothing out of short-term fluctuations, for example, keeping the nation's currency undervalued so as to stimulate exports.

Doha Round The multilateral trade negotiations launched in November 2001 in Daha (Qatar) and scheduled to be completed in 2004, that will address, among other things greater trade access by developing countries in developed countries' markets.

Dollar glut The excess supply of dollars in the hands of foreign monetary authorities that developed during the late 1950s and early 1960s.

Dollar overhang The large amount of foreign-held dollars resulting from past U.S. balance-of-payments deficits, the movement of which from monetary center to monetary center can lead to large exchange rate fluctuations and complicates the conduct of monetary policies.

Dollar shortage The inability of war-torn nations during the late 1940s and early 1950s to accumulate substantial dollar reserves.

Dollar standard The international monetary system that emerged from the Smithsonian Agreement in December 1971 under which the U.S. dollar remained an international currency and reserve without any gold backing.

Dollarization The situation whereby a nation adopts another nation's currency as its legal tender.

Domestic value added Equals the price of a final commodity minus the cost of the imported inputs going into the production of the commodity.

Double-entry bookkeeping The accounting procedure whereby each (international) transaction is entered twice, once as a credit and once as a debit of an equal amount.

Double factoral terms of trade The ratio of the price index of the nation's exports to the price index of its imports times the ratio of the productivity index in the nation's export sector to the productivity index in the nation's import-competing sector.

Dumping The export of a commodity at below cost or at a lower price than sold domestically.

Dutch disease The appreciation of a nation's currency resulting from the exploitation of a domestic resource that was previously imported, and the resulting loss of international competitiveness in the nation's traditional sector.

Duty-free zones or free economic zones Areas set up to attract foreign investments by allowing raw materials and intermediate products duty free.

Dynamic analysis Deals with the time path and process of adjustment from one equilibrium position to another.

Dynamic external economies The decline in the average cost of production as cumulative industry output increases and firms accumulate knowledge over time.

E

Economic integration The commercial policy of discriminatively reducing or eliminating trade barriers only among the nations joining together.

Economic union Removes all barriers on trade among members, harmonizes trade policies toward the rest of the world, allows the free movement of labor and capital among member nations, and also harmonizes or unifies the monetary, fiscal, and tax policies of its members.

Edgeworth box diagram The diagram constructed from the isoquants of two commodities and the given quantities available of two factor inputs.

Effective exchange rate A weighted average of the exchange rates between the domestic currency and the nation's most important trade partners, with weights given by the relative importance of the nation's trade with each of these trade partners.

Efficiency of foreign exchange markets The situation in which forward exchange rates accurately predict future spot rates.

Elasticity approach The change in the trade balance resulting from a depreciation or devaluation and depending on the price elasticity of demand for the nation's exports and imports.

Elasticity of substitution The degree or ease with which one factor can be substituted for another in production when the price of the factor declines.

Elasticity pessimism The belief, arising from the empirical studies of the 1940s, that foreign exchange markets were either unstable or barely stable.

Endogenous growth theory The theory that seeks to identify in detail and rigorously the actual channels or the ways by which freer trade leads to faster long-run economic growth and development.

Engine of growth The view that exports were the leading sector that propelled the economies of the regions of recent settlement into rapid growth and development during the nineteenth century.

Environmental standards The level of pollution accepted in various countries.

Equilibrium level of national income (Y_E) The level of income at which desired or planned expenditures equal the value of output, and desired saving equals desired investment.

Equilibrium-relative commodity price in isolation The relative commodity price at which a nation is maximizing its welfare in isolation. It is given by the slope of the common tangent to the nation's production frontier and indifference curve at the autarky point of production and consumption.

Equilibrium-relative commodity price with trade The common relative commodity price in two nations at which trade is balanced.

Escape clause A protectionist device that allowed any industry that claimed injury from imports to petition the International Trade Commission, which could then recommend to the president to revoke any negotiated tariff reduction.

Euler's theorem The theorem that postulates that if constant returns to scale prevail in production and each factor is rewarded (paid) according to its productivity, the output produced is exhausted and just exhausted.

Euro The common currency adopted at the beginning of 1999 by 11 of the 15 member countries of the European Union.

Eurobonds Long-term debt securities sold outside the borrower's country to raise long-term capital in a currency other than the currency of the nation where the securities are sold.

Eurocurrency Commercial bank deposits in a nation denominated in a foreign currency.

Eurocurrency market The market where Eurocurrencies are borrowed and lent.

Euronotes Medium-term financial instruments falling somewhere between short-term Eurocurrency bank loans and long-term Eurobonds.

European Central Bank (ECB) The institution similar to the Federal Reserve System in the United States that would control the money supply and issue the single currency of the European Union to be set up by 1997 or 1999.

European Currency Unit (ECU) The unit of account defined by the European Monetary System, based on the weighted average of the currencies of the EU members.

European Economic Area (EEA) The free trade area formed by the 12 members of the EU and 5 of the 7 members of the EFTA on January 1, 1994.

European Free Trade Association (EFTA) The free trade area that was formed in 1960 by the United Kingdom, Austria, Denmark, Norway, Portugal, Sweden, and Switzerland, with Finland an associate member in 1961. Iceland acceded in 1970. In 1973, the United Kingdom and Denmark left the EFTA to join the EU. Finland became a full member of the EFTA in 1986 and Liechtenstein in 1991. In 1995, Austria, Finland, and Sweden left the EFTA and joined the EU.

European Monetary Cooperation Fund (EMCF) The institution of the European Monetary System that provides short-term and medium-term balance-of-payments assistance to member nations.

European Monetary Institute (EMI) The forerunner of the European Central Bank that was set up in January 1994 by the Maastrich Treaty of December 1991 to further centralize members' macroeconomic policies and reduce exchange rate fluctuation margins.

European Monetary System (EMS) The organization formed by the members of the European Union (EU) in 1979 based on the creation of the European currency unit (ECU) of account, limited exchange rate flexibility among members, and formation of the European Monetary Fund (EMF).

European Monetary Union (EMU) The 12 members of the European Union that have adopted the euro as their common currency and have established the European Central Bank to conduct their common monetary policy.

European Union (EU) The customs union formed by West Germany, France, Italy, Belgium, the Netherlands, and Luxembourg that came into existence in 1958, and expanded to 15 nations with the joining of the United Kingdom, Denmark, and Ireland in 1973, Greece in 1981, Spain and Portugal in 1986, and Austria, Finland, and Sweden in 1995.

Exchange controls Restrictions on international capital flows, official intervention in forward markets, multiple exchange rates, and other financial and monetary restrictions imposed by a nation.

Exchange rate The domestic currency price of the foreign currency.

Exchange rate mechanism (ERM) The arrangement of the European Monetary System under which the currencies of member countries were allowed to fluctuate by plus or minus 2.25 percent of their central rates.

Exchange rate overshooting The tendency of exchange rates to immediately depreciate or appreciate by more than required for long-run equilibrium, and then partially reversing their movement as they move toward their long-run equilibrium levels.

Expansion path The line joining the origin with points of producer's equilibrium obtained by increasing expenditures on inputs with input prices constant.

Expected change in the spot rate The change in the spot (exchange) rate that is expected to occur in the future.

Expected prices The prices that are believed will prevail.

Expenditure-changing policies Fiscal and monetary policies directed at changing the level of aggregate demand of the nation.

Expenditure-switching policies Devaluation or revaluation of a nation's currency directed at switching the nation's expenditures from foreign to domestic or from domestic to foreign goods.

Export controls The type of international commodity agreement that seeks to regulate the quantity of the commodity exported by each nation.

Export function The relationship between exports and income. With exports exogenous, the export function is horizontal. That is, exports are independent of (or do not change with) the level of national income.

Export-Import Bank A U.S. government agency that extends subsidized loans to foreigners to finance U.S. exports.

Export instability Short-run fluctuations in export prices and earnings.

Export-oriented industrialization The policy of industrialization pursued by some developing nations that involves increasing the output of manufactured goods for export.

Export pessimism The feeling that developing countries' exports to developed countries cannot grow rapidly because of the latter's increased protectionism.

Export subsidies The granting of tax relief and subsidized loans to potential exporters, and low-interest loans to foreign buyers of the nation's exports.

Export tariff A tax or duty on exports.

External balance The objective of equilibrium in a nation's balance of payments.

External economies The reduction in each firm's average costs of production as the entire industry output expands.

F

Factor abundance The factor of production available in greater proportion and at a lower relative price in one nation than in another nation.

Factor endowments See factor abundance.

Factor-intensity reversal The situation where a commodity is L intensive when the relative price of labor is low and K intensive when the relative price of capital is low. If prevalent, this would lead to rejection of the H–O trade model.

Factor–price equalization (H–O–S) theorem The part of the H–O theory that predicts, under highly restrictive assumptions, that international trade will bring about equalization in relative and absolute returns to homogeneous factors across nations.

Factor-proportions or **factor-endowment theory** See Heckscher–Ohlin theory.

Financial account It shows the change in U.S. assets abroad and foreign assets in the United States, other than official reserve assets.

Financial inflow An increase in foreign assets in the nation or reduction in the nation's assets a broad.

Financial outflow A decrease in foreign assets in the nation or increase in the nation's assets a broad.

First credit tranche The 25 percent of a nation's quota in the IMF that the nation is required to pay in SDRs or in the currencies of other members selected by the Fund and could then borrow from the Fund almost automatically.

Footloose industries Industries that face neither substantial weight gains nor losses during the production process and thus tend to locate where the availability of other inputs leads to lowest overall manufacturing costs.

Foreign debt The hundreds of billions of dollars that developing countries owe to commercial banks in developed countries and that they find difficult to repay or even service (i.e., pay interest on).

Foreign exchange futures A forward contract for standardized currency amounts and selected calendar dates traded on an organized market (exchange).

Foreign exchange market The framework for the exchange of one national currency for another.

Foreign exchange options A contract specifying the right to buy or sell a standard amount of a traded currency at or before a stated date.

Foreign exchange risk The risk resulting from changes in exchange rates over time and faced by anyone who expects to make or to receive a payment in a foreign currency at a future date; also called an open position.

Foreign exchange swap The spot sale of a currency combined with a forward repurchase of the same currency—as part of a single transaction.

Foreign repercussions The effect that a change in a large nation's income and trade has on the rest of the world and which the rest of the world in turn has on the nation under consideration. This is how business cycles are transmitted internationally.

Foreign Sales Corporation (FSC) The overseas subsidiaries set up by U.S. corporations to take advantage of partial exemption from U.S. tax laws.

Foreign trade multiplier (k') The ratio of the change in income to the change in exports and/or investment. It equals $k' = 1/(MPS + MPM)$.

Forward discount The percentage per year by which the forward rate on the foreign currency is below its spot rate.

Forward premium The percentage per year by which the forward rate on the foreign currency is above its spot rate.

Forward rate The exchange rate in foreign exchange transactions involving delivery of the foreign exchange one, three, or six months after the contract is agreed upon.

Freely floating exchange rate system The flexible exchange rate system under which the exchange rate is always determined by the forces of demand and supply without any government intervention in foreign exchange markets.

Free trade area Removes all barriers on trade among members, but each nation retains its own barriers on trade with non-members. The best examples are the EFTA, NAFTA, and Mercosur.

Fundamental disequilibrium Large and persistent balance-of-payments deficits or surpluses.

G

Gains from exchange The increase in consumption resulting from exchange alone and with the nation continuing to produce at the autarky point.

Gains from specialization The increase in consumption resulting from specialization in production.

Gains from trade The increase in consumption in each nation resulting from specialization in production and trading.

Game theory A method of choosing the optimal strategy in conflict situations.

General Agreements on Tariffs and Trade (GATT) An international organization devoted to the promotion of freer trade through multilateral trade negotiations.

General Arrangements to Borrow (GAB) The arrangements under which the IMF negotiated to borrow from the "Group of Ten" (most important industrial nations) and Switzerland to augment its resources if needed to help nations with balance-of-payments difficulties.

General equilibrium analysis The study of the interdependence that exists among all markets in the economy.

General equilibrium model An economic model that studies the behavior of all producers, consumers, and traders simultaneously.

Globalization The increasing integration of economies around the world, particularly through trade and financial flows, but also through the movement of ideas and people, facilitated by the revolution in telecommunication and transportation.

Gold export point The mint parity plus the cost of shipping an amount of gold equal to one unit of the foreign currency between the two nations.

Gold import point The mint parity minus the cost of shipping an amount of gold equal to one unit of the foreign currency between the two nations.

Gold standard The international monetary system operating from about 1880 to 1914 under which gold was the only international reserve, exchange rates fluctuated only within the gold points, and balance-of-payments adjustment was described by the price-specie-flow mechanism.

Gold tranche The 25 percent of a nation's quota in the IMF that the nation was originally required to pay in gold and could then borrow from the Fund almost automatically.

Gravity model It postulates that (other things equal) the bilateral trade between two countries is proportional or at least positively related to the product of the two countries' GDPs, and smaller the greater the distance between the two countries (just like in Newton's law of gravity in physics).

Group of Twenty (G-20) The group of the 20 most important developed and developing economies that essentially replaced the G-7 as the steering committee of the world economy in 2008.

H

Heckscher–Ohlin (H–O) theorem The part of the Heckscher–Ohlin theory that postulates that a nation will export the commodity intensive in its relatively abundant and cheap factor and import the commodity intensive in its relatively scarce and expensive factor.

Heckscher–Ohlin (H–O) theory The theory that postulates that (1) a nation exports commodities intensive in its relatively abundant and cheap factor and (2) international trade brings about equalization in returns to homogeneous factors across countries.

Hedging The avoidance of a foreign exchange risk (or the covering of an open position).

High-performance Asian economies (HPAEs) Hong Kong, Korea, Singapore, and Taiwan characterized by rapid growth in gross domestic product (GDP), in industrial production, and in manufactured exports; also called newly industrialized economies (NIEs).

Homogeneous of degree 1 A production function exhibiting constant returns to scale.

Horizontal integration The production abroad of a differentiated product that is also produced at home.

Human capital The education, job training, and health embodied in workers, which increase their productivity.

I

Identification problem The inability of the regression technique to identify shifts in demand curves from shifts in supply curves, leading to the underestimation of price elasticities in empirical studies of international trade.

IMF conditionality The conditions imposed by the IMF on members' borrowings from the Fund.

Immiserizing growth The situation where a nation's terms of trade deteriorate so much as a result of growth that the nation is worse off after growth than before, even if growth without trade tends to improve the nation's welfare.

Import function The positive relationship between the nation's imports and national income.

Import substitutes Commodities (such as automobiles in the United States) that a nation produces at home but also imports from other nations (because of incomplete specialization in production).

Import-substitution industrialization (ISI) The industrialization policy that many developing nations followed during the 1950s, 1960s, and 1970s involving the replacement of imports of industrial goods with domestically produced goods.

Import tariff A tax or duty on imports.

Income elasticity of demand for imports (n_Y) The ratio of the percentage change in imports to the percentage change in national income; it is equal to MPM/APM.

Income terms of trade The ratio of the price index of the nation's exports to the price index of its imports times the index of the nation's volume of exports.

Incomplete specialization The continued production of both commodities in both nations with increasing costs, even in a small nation with trade.

Increasing opportunity costs The increasing amounts of one commodity that a nation must give up to release just enough resources to produce each additional unit of another commodity. This is reflected in a production frontier that is concave from the origin.

Increasing returns to scale The production situation where output grows proportionately more than the increase in inputs or factors of production. For example, doubling all inputs more than doubles output.

Industrial policy An activist policy by the government to stimulate the development and growth of some industry (usually a high-tech industry) in an industrial nation.

Infant-industry argument The argument that temporary trade protection is needed to set up an industry and to protect it during its infancy against competition from more established and efficient foreign firms.

Inferior goods Those goods for which consumption declines absolutely if income rises and increases absolutely if income falls (so that the income elasticity of demand is negative).

Inflation targeting The monetary policy of achieving a specific target for inflation for the nation.

Input–output table A matrix or table showing the origin and destination of each product in the economy.

Interdependence The (economic) relationships among nations.

Interest arbitrage The transfer of short-term liquid funds abroad to earn a higher return.

Internal balance The objective of full employment with price stability; usually a nation's most important economic objective.

Internal factor mobility The movement within a nation of factors of production from areas and industries of lower earnings to areas and industries of higher earnings.

International Bank for Reconstruction and Development (IBRD or World Bank) The international institution established after World War II to provide long-run development assistance to developing nations.

International cartel An organization of suppliers of a commodity located in different nations (or a group of governments) that agrees to restrict output and exports of the commodity with the aim of maximizing or increasing the total profits of the organization. An international cartel that behaves as a monopolist is called a centralized cartel.

International commodity agreements Organizations of producer and consumer nations attempting to stabilize and increase the prices and earnings of the primary exports of developing nations.

International Development Association (IDA) The affiliate of the International Bank for Reconstruction and Development set up in 1960 to make loans at subsidized rates to poorer developing nations.

International economies of scale The increased productivity resulting from the firm's integration of its entire system of manufacturing operations around the world.

International factor mobility The movement of factors of production across national boundaries, usually from nations of lower earnings to nations of higher earnings.

International finance The study of foreign exchange markets, the balance of payments, and adjustment to balance-of-payments disequilibria.

International Finance Corporation (IFC) The affiliate of the International Bank for Reconstruction and Development set up in 1956 to stimulate *private* investments in developing nations from indigenous and foreign sources.

International investment position The total amount and the distribution of a nation's assets abroad and foreign assets in the nation at year-end; also called the balance of international indebtedness.

International macroeconomic policy coordination The modifications of national economic policies in recognition of international interdependence.

International Monetary Fund (IMF) The international institution created under the Bretton Woods system for the purposes of (1) overseeing that nations followed a set of agreed-upon rules of conduct in international trade and finance and (2) providing borrowing facilities for nations in temporary balance-of-payments difficulties.

International monetary system The rules, customs, instruments, facilities, and organizations for effecting international payments.

International Trade Organization (ITO) An international organization that was to regulate international trade after World War II. It was never ratified by the U.S. Senate and never came into existence. Its place was taken by GATT, which was less ambitious.

International trade policy Examines the reasons for and effects of trade restrictions.

International trade theory Analyzes the basis and the gains from trade.

Intervention currency A convertible national currency (primarily the U.S. dollar) used by nations' monetary authorities to intervene in foreign exchange markets in order to keep the exchange rate from moving outside the allowed or desired range of fluctuation.

Intra-industry trade International trade in the differentiated products of the same industry or broad product group.

Intra-industry trade index (T) It is given by 1 minus the ratio of the absolute value of exports minus imports over exports plus imports.

Investment function The relationship between investment expenditures and income. With investment exogenous, the investment function is horizontal when plotted against income. That is, investment expenditures are independent of (or do not change with) the level of national income.

***IS* curve** The negatively inclined curve showing the various combinations of interest rates and national income levels at which the goods market is in equilibrium.

Isocost A line showing the various combinations of two inputs that a firm can hire for a given expenditure and factor prices.

Isoquant A curve showing the various combinations of two factors or inputs that a firm can use to produce a specific level of output.

J

Jamaica Accords The agreements reached in January 1976 and ratified in April 1978 that recognized the managed float and abolished the official price of gold.

J-curve effect The deterioration before a net improvement in a country's trade balance resulting from a depreciation or devaluation.

K

Kennedy Round The multilateral trade negotiations that were completed in 1967 (under the authority of the 1962 Trade Expansion Act) under which agreement was reached to reduce average tariff duties on industrial products by 35 percent.

L

Labor–capital ratio (L/K) The amount of labor per unit of capital used in the production of a commodity.

Labor-intensive commodity The commodity with the higher labor-capital ratio (L/K) at all relative factor prices.

Labor-saving technical progress Technical progress that increases the productivity of capital proportionately more than the productivity of labor and results in an increase in K/L at constant relative factor prices.

Labor theory of value The theory that the cost or price of a commodity is determined by or can be inferred exclusively from its labor content.

Laissez-faire The policy of minimum government interference in or regulation of economic activity, advocated by Adam Smith and other classical economists.

Law of comparative advantage Explains how mutually beneficial trade can take place even when one nation is less efficient than, or has an absolute disadvantage with respect to, another nation in the production of all commodities. The less efficient nation should specialize in and export the commodity in which its absolute disadvantage is smaller (this is the commodity of its comparative advantage), and should import the other commodity.

Law of one price The proposition that in the absence of transportation costs, tariffs, and other obstructions to the free flow of trade, the price of each homogeneous (identical) traded commodity will be equalized in all markets by commodity arbitrage.

Law of reciprocal demand The equilibrium relative commodity price with trade determined at the intersection of the nations' reciprocal demand or offer curves.

Leaning against the wind The policy of monetary authorities supplying part of the excess demand or absorbing part of the excess supply of foreign exchange in the market to smooth out short-run fluctuations in exchange rates.

Learning curve The curve showing the degree by which average costs of production decline as cumulative industry output increases over time.

Leontief paradox The empirical finding that U.S. import substitutes were more K intensive than U.S. exports. This is contrary to the H–O trade model, which predicts that, as the most K-abundant nation, the United States should import L-intensive products and export K-intensive products.

Liquidity The amount of international reserve assets available to nations to settle temporary balance-of-payments disequilibria.

***LM* curve** The usually positively inclined curve showing the various combinations of interest rates and national income levels at which the money market is in equilibrium.

Long-run aggregate supply (LRAS) curve The fixed relationship between the nation's price level and its natural level of output, which depends on the availability of labor, capital, natural resources, and technology in the nation.

M

Maastricht Treaty The treaty that called for the creation of the European Monetary Institute as a forerunner of the European Central Bank and monetary union by the European Union by 1997 or 1999.

Macroeconomics The study of the whole or the aggregate, such as the total receipts and payments of a nation and the general price index.

Managed floating exchange rate system The policy of intervention in foreign exchange markets by monetary authorities to smooth out short-run fluctuations without attempting to affect the long-run trend in exchange rates.

Marginal propensity to consume (MPC) The ratio of the change in consumption expenditures to the change in income, or $\Delta C/\Delta Y$.

Marginal propensity to import (MPM) The ratio of the change in imports to the change in national income, or $\Delta M/\Delta Y$.

Marginal propensity to save (MPS) The ratio of the change in saving to the change in income, or $\Delta S/\Delta Y$.

Marginal rate of substitution (MRS) The amount of one commodity that a nation could give up in exchange for one extra unit of a second commodity and still remain on the same indifference curve. It is given by the slope of the community indifference curve at the point of consumption and declines as the nation consumes more of the second commodity.

Marginal rate of technical substitution of labor for capital in production (MRTS) It shows how much capital a firm can give up by increasing labor by one unit and still remain on the same isoquant.

Marginal rate of transformation (MRT) The amount of one commodity that a nation must give up to produce each additional unit of another commodity. This is another name for the opportunity cost of a commodity and is given by the slope of the production frontier at the point of production.

Market-oriented industries Industries that produce goods that become heavier or more difficult to transport during production and thus locate near the markets for the product.

Marketing boards National schemes set up by several developing nations after World War II to stabilize export prices for individual producers of an agricultural commodity.

Marshall–Lerner condition Indicates that the foreign exchange market is stable when the sum of the price elasticities of the *demands* for imports and exports is larger than 1 (when the *supply* elasticities of imports and exports are infinite).

Mercantilism The body of writings prevailing during the seventeenth and eighteenth centuries that postulated that the way for a nation to become richer was to restrict imports and stimulate exports. Thus, one nation could gain only at the expense of other nations.

Mercosur The South American, or Southern Cone, Common Market that was formed by Argentina, Brazil, Paraguay, and Uruguay in 1991.

Metzler paradox The exception to the Stolper–Samuelson theorem.

Microeconomics The study of individual units, such as a particular nation and the relative price of a single commodity.

Mint parity The fixed exchange rates resulting under the gold standard from each nation defining the gold content of its currency and passively standing ready to buy or sell any amount of gold at that price.

Monetary approach to the balance of payments The approach that views the balance of payments as an essentially monetary phenomenon with money playing the key role in the long run as both the cause and the cure of balance-of-payments disequilibria or in determining exchange rates.

Monetary base The domestic credit created by the nation's monetary authorities plus the nation's international reserves.

Monopolistic competition The form of market organization where there are many firms selling a differentiated product and entry into or exit from the industry is relatively easy.

Monopoly The form of market organization where there is a single producer of a commodity for which there is no close substitute.

Most-favored-nation principle The extension to all trade partners of any reciprocal tariff reduction negotiated by the United States with any other nation.

Multilateral trade negotiations Trade negotiations among many nations.

Multinational corporations (MNCs) Firms that own, control, or manage production and distribution facilities in several countries.

Multiple exchange rates The different exchange rates often enforced by developing nations for each class of imports depending on the usefulness of the various imports as determined by the government.

Multiplier (k) The ratio of the change in income to the change in investment; in a closed economy without government, $k = 1/MPS$.

Mundell–Fleming model The model that shows how a nation can use fiscal and monetary policies to achieve both internal and external balance without any change in the exchange rate.

N

National security clause A protectionist device that prevented any tariff reduction (even if already negotiated) that would hurt industries important for national defense.

Natural level of output (Y_N) The fixed level of output that a nation can produce in the long run with its given quantity of labor, capital, natural resources, and technology.

Net IMF position The size of a nation's quota in the IMF minus the Fund's holdings of the nation's currency.

Neutral production and consumption Increases in production and consumption that lead to proportionate increases in the volume of trade.

Neutral technical progress Technical progress that increases the productivity of labor and capital in the same proportion and leaves K/L constant at constant relative factor prices.

New Arrangement to Borrow (NAB) The arrangement negotiated by the International Monetary Fund at the beginning of 1997 under which 25 participant countries and institutions agreed to lend up to SDR34 billion (about $47 billion) to supplement the General Arrangements to Borrow (GAB) for a period of five years (subject to renewal).

New International Economic Order (NIEO) The demands made by developing nations as a group at the United Nations for the removal of the alleged inequities in the operation of the present international economic system and for specific steps to be taken to facilitate their development.

New protectionism New forms of nontariff trade barriers.

Newly Independent States (NIS) Includes Armenia, Azerbaijan, Belarus, Estonia, Georgia, Kazakhstan, the Kyrgyz Republic, Latvia, Lithuania, Moldova, Russia, Tajikistan, Turkmenistan, Ukraine, and Uzbekistan.

Newly industrialized economies (NIEs) Hong Kong, Korea, Singapore, and Taiwan characterized by rapid growth in gross domestic product (GDP), in industrial production, and in manufactured exports; also called high-performance Asian economies (HPAEs).

Nominal tariff A tariff (such as an ad valorem one) calculated on the price of a final commodity.

Nontariff trade barriers (NTBs) Trade restrictions other than tariffs, such as voluntary export restraints; technical, administrative, and other regulations; as well as those arising from international cartels, dumping, and export subsidies.

Nontraded goods and services Those goods and services that are not traded internationally because the cost of transporting them exceeds the international price difference.

Normal goods Those goods for which consumption changes in the same direction as a change in income (so that the income elasticity of demand is positive).

North American Free Trade Agreement (NAFTA) The agreement to establish a free trade area among the United States, Canada, and Mexico that came into existence on January 1, 1994.

O

Offer curve A curve that shows how much of its import commodity a nation demands to be willing to supply various amounts of its export commodity, or the willingness of the nation to import and export at various relative commodity prices.

Official reserve account It measures the change in U.S. official reserve assets and the change in foreign official reserve assets in the United States.

Official settlements balance The net credit or debit balance in the official reserve account.

Offshore deposits Bank deposits denominated in a currency other than that of the nation in which the deposit is held.

Offshoring It refers to a firm producing products in its own plant abroad and some of the parts and components that it uses in its products produced at home.

Oligopoly The form of market organization where there are only a few producers of a homogeneous or differentiated product.

Omnibus Trade and Competitiveness Act of 1988 Through its Super 301 provision, the Act requires curbing imports from countries that do not remove major barriers to the U.S. exports.

Open-economy macroeconomics The study of foreign exchange markets, the balance of payments, and adjustment to balance-of-payments disequilibria.

Opportunity cost theory The theory that the cost of a commodity is the amount of a second commodity that must be given up to release just enough resources to produce one more unit of the first commodity.

Optimum currency area or bloc Refers to a group of nations whose national currencies are linked through permanently fixed exchange rates and the conditions that would make such an area optimum.

Optimum tariff The rate of tariff that maximizes the benefit resulting from improvement in the nation's terms of trade against the negative effect resulting from reduction in the volume of trade.

Original sin The inability of a developing country to borrow in its own currency.

Outsourcing The firm's purchase of parts and components abroad to keep costs down in a globalizing world.

P

Partial equilibrium analysis The study of individual decisionmaking units (such as a firm or nation) in isolation (i.e., abstracting from all the interconnections that exist between the firm or nation and the rest of the economy or world).

Pass-through effect The proportion of an exchange rate change that is reflected in export and import price changes.

Pattern of trade The commodities exported and imported by each nation.

Perfect competition The market condition where (1) there are many buyers and sellers of a given commodity or factor, each too small to affect the price of the commodity or factor; (2) all units of the same commodity or factor are homogeneous, or of the same quality; (3) there is perfect knowledge and information on all markets; and (4) there is perfect internal mobility of factors of production.

Peril-point provisions A protectionist device that prevented the president from negotiating any tariff reduction that would cause serious damage to a domestic industry.

Persistent dumping The *continuous* tendency of a domestic monopolist to maximize total profits by selling the commodity at a lower price abroad than domestically; also called international price discrimination.

Phillips curve The controversial inverse relationship, or trade-off, between unemployment and inflation.

Portfolio balance approach The theory that postulates that exchange rates are determined in the process of equilibrating or balancing the demand and supply of financial assets in each country.

Portfolio investments The purchase of purely financial assets, such as bonds and stocks (if the stock purchase represents less than 10 percent of the stock of a corporation), usually arranged through banks and investment funds.

Portfolio theory Maintains that by investing in securities with yields that are inversely related over time, a given yield can be obtained at a smaller risk or a higher yield can be obtained at the same level of risk for the portfolio as a whole.

Predatory dumping The *temporary* sale of commodity at a lower price abroad in order to drive foreign producers out of business, after which prices are raised to take advantage of the newly acquired monopoly power abroad.

Preferential trade arrangements The loosest form of economic integration; provides lower barriers to trade among participating nations than on trade with nonparticipating nations. An example is the British Commonwealth Preference Scheme.

Price-specie-flow mechanism The automatic adjustment mechanism under the gold standard. It operates by the deficit nation losing gold and experiencing a reduction in its money supply. This in turn reduces domestic prices, which stimulates the nation's exports and discourages its imports until the deficit is eliminated. A surplus is corrected by the opposite process.

Principle of effective market classification Maintains that policy instruments should be paired or used for the objective toward which they are most effective.

Product cycle model The hypothesis, advanced by Vernon, that new products introduced by industrial nations and produced with skilled labor eventually become standardized and can be produced in other nations with less skilled labor.

Production contract curve The curve joining points at which the isoquants of two commodities are tangent and factor inputs are used most efficiently.

Production effect of a tariff The increase in domestic production of a commodity resulting from the increase in its price due to a tariff.

Production function A relationship showing the maximum quantities of a commodity that a firm can produce with various amounts of factor inputs.

Production possibility frontier A curve showing the various alternative combinations of two commodities that a nation can produce by fully utilizing all of its resources with the best technology available to it.

Prohibitive tariff A tariff sufficiently high to stop all international trade so that the nation returns to autarky.

Protection cost or deadweight loss of a tariff The real losses in a nation's welfare because of inefficiencies in production and distortions in consumption resulting from a tariff.

Protrade production and consumption Increases in production and consumption that lead to greater than proportionate increases in the volume of trade.

Purchase contracts Long-term multilateral agreements that stipulate the minimum price at which importing nations agree to purchase a specified quantity of the commodity and a maximum price at which exporting nations agree to sell specified amounts of the commodity.

Purchasing-power parity (PPP) theory The theory that postulates that the change in the exchange rate between two currencies is proportional to the change in the ratio in the two countries' general price levels.

Q

Quantity theory of money Postulates that the nation's money supply times the velocity of circulation of money is equal to the nation's general price index times physical output at full employment. With V and Q assumed constant, the change in P is directly proportional to the change in M.

Quota A direct *quantitative* restriction on trade.

R

Rate of effective protection The tariff calculated on the domestic value added in the production of a commodity.

Real exchange rate The nominal exchange rate weighed by the consumer price index in the two nations.

Reciprocal demand curve Another name for the offer curve.

Regions of recent settlement The mostly empty and resource-rich lands that Europeans settled during the nineteenth century, such as the United States, Canada, Argentina, Uruguay, Australia, New Zealand, and South Africa.

Relative commodity prices The price of one commodity divided by the price of another commodity. This equals the opportunity cost of the first commodity and is given by the absolute slope of the production possibility frontier.

Relative factor prices The ratio of the price of one factor of production to the price of the other factor. With labor and capital as the factors of production, the relative price of labor is w/r and the relative price of capital is the inverse, or r/w.

Relative purchasing-power parity theory Postulates that the change in the exchange rate over a period of time should be proportional to the relative change in the price levels in the two nations. This version of the PPP theory has some value.

Renminbi or yuan The currency of china.

Rent or producer surplus A payment that need not be made in the long run in order to induce producers to supply a specific amount of a commodity or factor services.

Reserve-currency country (RCC) A country, such as the United States, whose currency is held by other nations as international reserves.

Resource-oriented industries Industries which process bulky and heavy raw materials into lighter finished products and thus locate near raw material sources.

Revenue effect of a tariff The revenue collected by the government from the tariff.

Risk diversification Investments in securities with yields that are inversely, or negatively, correlated or investments in different lines or products in order to spread and thus reduce the overall risks of the total investments.

Risk premium The extra return that investors require to purchase or hold on to foreign bonds to compensate them for the additional currency and country risks involved in holding foreign bonds.

Roosa bonds Medium-term treasury bonds denominated in dollars but with an exchange rate guarantee, created by the United States in the early 1960s to induce foreign monetary authorities to continue to hold dollars rather than exchange them for gold at the Federal Reserve.

Rules of the game of the gold standard The requirement under the gold standard that monetary authorities restrict credit in the deficit nation and expand credit in the surplus nation (thus reinforcing the effect of changes in international gold flows on the nation's money supply).

Rybczynski theorem Postulates that at constant commodity prices, an increase in the endowment of one factor will increase by a greater proportion the output of the commodity intensive in that factor and will reduce the output of the other commodity.

S

Same technology Equal production techniques; it results in equal K/L in the production of each commodity in both nations if relative factor prices are the same in both nations.

Saving function The relationship between saving and income. In general, saving is negative when income is zero and rises as income rises, in such a way that the increase in consumption plus the increase in saving equals the increase in income.

Scientific tariff The tariff rate that would make the price of imports equal to domestic prices so as to allow domestic producers to meet foreign competition.

Seigniorage The benefit accruing to a nation from issuing the currency or when its currency is used as an international currency and reserve.

Shared Foreign Sales Corporations U.S. tax legislation aimed at stimulating U.S. exports by reducing the effective rate of taxation on export income.

Short-run aggregate supply (SRAS) curve The temporary positive relationship between the nation's output and the price level resulting from imperfect information or market imperfections.

Single factoral terms of trade The ratio of the price index of the nation's exports to the price index of its imports times the productivity index in the nation's export sector.

Small-country case The situation where trade takes place at the pretrade-relative commodity prices in the large nation so that the small nation receives all of the benefits from trade.

Smithsonian Agreement The agreement reached in December 1971 in Washington under which the dollar was devalued by about 9 percent (by increasing the dollar price of gold from \$35 to \$38 an ounce), other strong currencies were revalued by various amounts with respect to the dollar, the dollar convertibility into gold remained suspended, and exchange rates were allowed to fluctuate by 2.25 percent on either side of the new par values.

Smoot–Hawley Tariff Act of 1930 Raised average import duties in the United States to the all-time high of 59 percent in 1932.

Southern Common Market (see Mercosur)

Special Drawing Rights (SDRs) International reserves created by the IMF to supplement other international reserves and distributed to member nations according to their quotas in the Fund.

Specific-factors model The model to analyze the effect of a change in commodity price on the returns of factors in a nation when at least one factor is not mobile between industries.

Specific tariff A tariff expressed as a fixed *sum* per unit of a traded commodity.

Speculation The acceptance of a foreign exchange risk, or open position, in the hope of making a profit.

Speculative demand for money The demand for inactive money balances in preference to interest-bearing securities (which can fall in price) so that one may take advantage of future investment opportunities. The speculative, or liquidity, demand for money varies inversely with the rate of interest.

Sporadic dumping The *occasional* sale of a commodity at a lower price abroad than domestically in order to sell an unforeseen and temporary surplus of the commodity abroad without having to reduce domestic prices.

Spot rate The exchange rate in foreign exchange transactions that calls for the payment and receipt of the foreign exchange within two business days from the date when the transaction is agreed upon.

Stability and Growth Pact (SGP) The pact that requires members of the European Monetary Union to keep their budget deficits not exceeding 3 percent of their GDP.

Stabilizing speculation The purchase of a foreign currency when the domestic currency price of the currency (i.e., the exchange rate) falls or is low, in the expectation that the exchange rate will soon rise, thus leading to a profit. Or the sale of a foreign currency when the exchange rate rises or is high, in the expectation that it will soon fall.

Stable foreign exchange market The condition in a foreign exchange market where a disturbance from the equilibrium exchange rate gives rise to automatic forces that push the exchange rate back toward the equilibrium rate.

Stagflation The combination of recession or stagnation and increasing prices or inflation.

Standby arrangements The arrangements under which member nations negotiate with the IMF for advance approval for future borrowings from the Fund so they will be immediately available when needed.

State trading companies The state organizations in centrally planned economies handling trade in specific product lines.

Statistical discrepancy The entry made in a nation's balance of payments to make total credits equal to total debits, as required by double-entry bookkeeping.

Stolper–Samuelson theorem Postulates that an increase in the relative price of a commodity (for example, as a result of a tariff) raises the return or earnings of the factor used intensively in the production of the commodity.

Strategic trade policy The argument that an activist trade policy in oligopolistic markets subject to extensive external economies can increase a nation's welfare.

Subprime mortgage crisis The financial crisis that started in the U.S. housing market and then spread to the entire financial and economic sectors of the United States and the world.

Substitution account The account proposed to be used to exchange all foreign-held dollars for SDRs at the IMF to solve the problem of the dollar overhang.

Super gold tranche The amount by which the IMF's holdings of a nation's currency are below 75 percent of the nation's quota, which the nation could borrow from the Fund without the need to repay.

Supply of money The nation's total money supply is equal to the nation's monetary base times the money multiplier.

Surplus in the balance of payments The excess of credits over debits in the current and capital accounts, or autonomous transactions; equal to the net *debit* balance in the official reserve account, or accommodating transactions.

Swap arrangements The arrangements under which national central banks negotiate to exchange each other's currency to be used to intervene in foreign exchange markets to combat international hot money flows.

Synthesis of automatic adjustments The attempt to integrate the automatic price, income, and monetary adjustments to correct balance-of-payments disequilibria.

T

Tariff factories Direct investments made in a nation or other economic unit (such as a customs union) to avoid import tariffs.

Technical, administrative, and other regulations Nontariff trade barriers such as safety, health, and labeling requirements, and border taxes.

Technological gap model The hypothesis that a portion of international trade is based on the introduction of new products or processes.

Terms of trade The ratio of the index price of a nation's export to its import commodities.

Terms-of-trade effect The change in the relative commodity prices at which a nation trades; it results from the tendency of the volume of trade to change as the nation grows.

Theory of the second best Postulates that when all of the conditions required to reach maximum social welfare or Pareto optimum cannot be satisfied, trying to satisfy as many of these conditions as possible does not necessarily or usually lead to the second-best welfare position.

Tokyo Round The multilateral trade negotiations that were completed in 1979 (under the authority of the 1974 Trade Reform Act) in which agreement was reached to cut average tariff rates by about 30 percent and to adopt a uniform international code of conduct for applying nontariff trade barriers.

Trade Adjustment Assistance The provision of the Trade Expansion Act of 1962 (and continued in subsequent Trade Acts), which provides to assist displaced workers and firms injured by trade liberalization.

Trade Agreements Act of 1934 Authorized the President to negotiate with other nations mutual tariff reductions of up to 50 percent under the most-favored-nation principle.

Trade controls Tariffs, quotas, advance deposits on imports, and other restrictions imposed by a nation on international trade.

Trade-creating customs union A customs union that leads to trade creation only and increases the welfare of both member and nonmember nations.

Trade creation Occurs when some domestic production in a member of the customs union is replaced by lower-cost imports from another member nation. This increases welfare.

Trade deflection The entry of imports from the rest of the world into the low-tariff member of a free trade area to avoid the higher tariffs of other members.

Trade diversion Occurs when lower-cost imports from outside the union are replaced by higher-cost imports from another union member. By itself, this reduces welfare.

Trade-diverting customs union A customs union that leads to both trade creation and trade diversion and may increase or reduce the welfare of member nations, depending on the relative strength of these two opposing forces.

Trade effect of a tariff The reduction in the volume of trade in the commodity resulting from a tariff.

Trade Expansion Act of 1962 Granted the President authority to negotiate across-the-board tariff reductions of up to 50 percent of their 1962 level and replaced the no-injury principle with adjustment assistance.

Trade indifference curve The curve showing the various trade situations that provide a nation equal welfare.

Trade or elasticities approach The theory or approach that stresses the role of trade or the flow of goods and services in the determination of exchange rates. This model is more useful in explaining exchange rates in the long run than in the short run.

Trade or commercial policies The regulations governing a nation's commerce or international trade.

Trade promotion authority or "**fast track**" Legislation granting to the president of the United States the right to negotiate global trade agreements with other nations that allowed no amendments, but only an up-or-down vote by Congress to ratify or reject the agreement (Sect. 9.7A).

Trade Reform Act of 1974 Granted the President authority to negotiate tariff reductions of up to 60 percent of their post-Kennedy Round level and to negotiate reductions in nontariff trade barriers.

Trade and Tariff Act of 1984 Authorized the President to negotiate the lowering of trade barriers in services and a free trade agreement with Israel, and extended the Generalized System of Preferences (GSP) until 1993.

Transaction demand for money The demand for active money balances to carry on business transactions; it varies directly with the level of national income and the volume of business transactions.

Transfer pricing The overpricing or underpricing of products in the intrafirm trade of multinational corporations in an attempt to shift income and profits from high- to low-tax nations.

Transfer problem Deals with the conditions under which a large and unusual capital transfer is actually accomplished by an export surplus of the paying nation and an equal import surplus of the receiving nation.

Transport or logistics costs Freight charges, warehousing costs, costs of loading and unloading, insurance premiums, and interest charges while goods are in transit (Sect. 6.6).

Trigger-price mechanism The antidumping mechanism introduced by the United States in 1978 to protect its steel industry by imposing a duty on underpriced imported steel to make its price equal to that of the lowest cost foreign producer.

Trilemma The policy dilemma of a nation being able to achieve only two of three policy choices: a fixed exchange rate system, unrestricted international finance flows, and monetary policy autonomy.

U

Uncovered interest arbitrage The transfer of short-term liquid funds to the international monetary center with higher interest rates without covering the foreign exchange risk.

Unilateral transfers Gifts or grants extended to or received from abroad.

United Nations Conferences on Trade and Development (UNCTAD) Special conferences held under the auspices of the United Nations in 1964, 1968, 1972, 1976, 1979, 1983, 1987, and 1992 at which developing nations advanced their demands to improve the operation of the present international economic system to facilitate their development.

Unstable foreign exchange market The condition in a foreign exchange market where a disturbance from equilibrium pushes the exchange rate farther away from equilibrium.

Uruguay Round The multilateral trade negotiations started in 1986 and completed at the end of 1993 aimed at reversing the trend of rising nontariff trade barriers. It replaced the GATT with the World Trade Organization (WTO), brought services and agriculture into the WTO, and improved the dispute settlement mechanism.

V

Variable import levies The import duties levied by the EU on imports of agricultural commodities and equal to the difference between the high farm prices established by the EU and the lower world prices.

Vehicle currency A currency such as the U.S. dollar used to denominate international contracts and for international transactions.

Vent for surplus The view that exports could be an outlet for the potential surplus of agricultural commodities and raw materials in some developing countries.

Vertical integration The expansion of a firm backward to supply its own raw materials and intermediate products and/or forward to provide its own sales or distribution networks.

Voluntary export restraints (VERs) Refer to an importing country inducing another country to “voluntarily” reduce its exports of a commodity to the importing nation under the threat of higher all-around trade restrictions.

W

Wealth effect The change in the output per worker or per person as a result of growth in the nation.

World Trade Organization (WTO) The organization set up at the Uruguay Round to replace the General Agreement on Tariffs and Trade (GATT) secretariat with authority over trade in industrial goods, agricultural commodities, and services, and with greater authority to settle trade disputes.

Y

Yuan or renminbi The currency of China.

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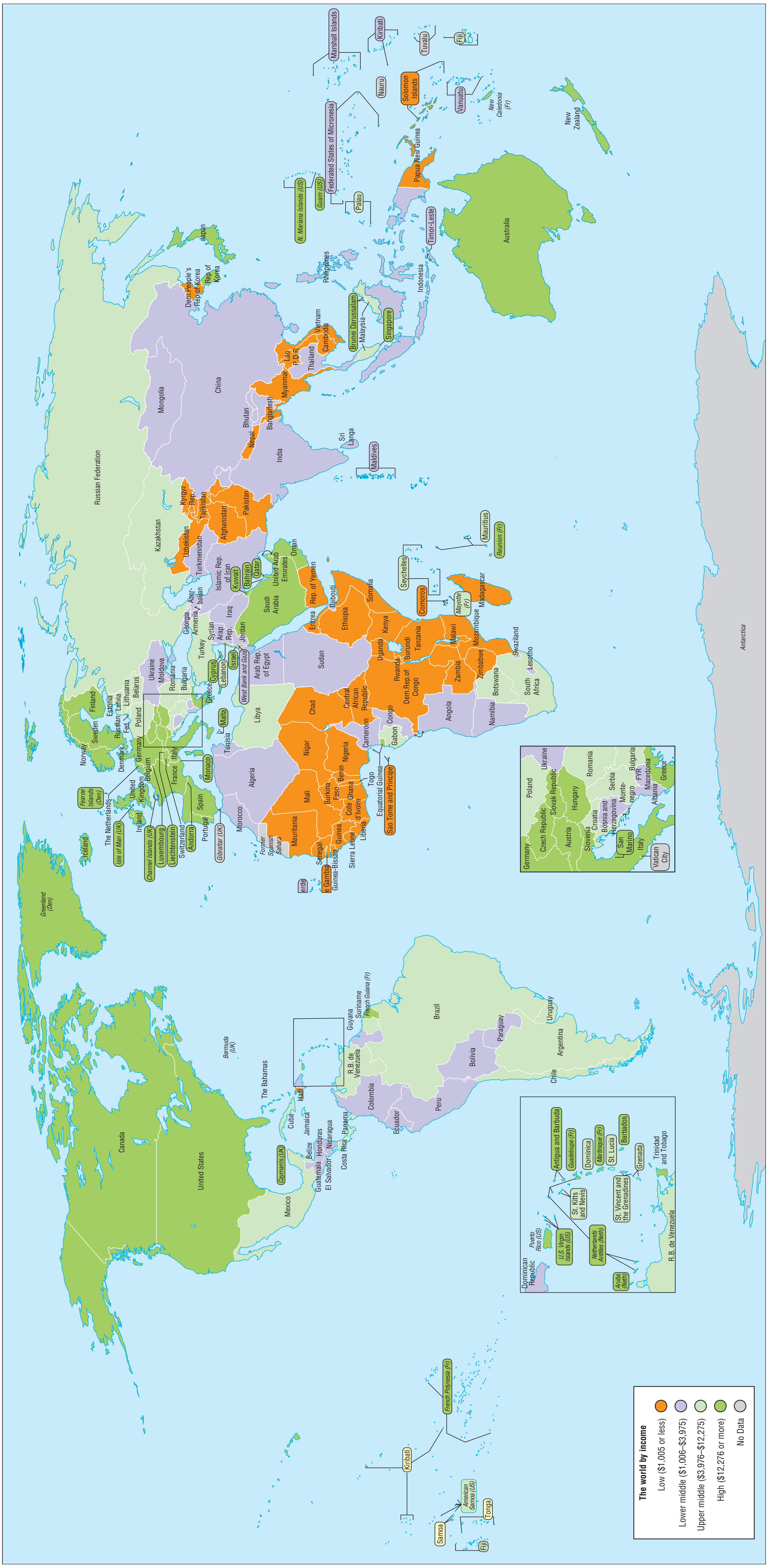

The world by income
Low ($1,005 or less)
Lower middle ($1,006–$3,975)
Upper middle ($3,976–$12,275)
High ($12,276 or more)
No Data
Canada
United States
Mexico
Greenland (Den)
Iceland
Russian Federation
Kazakhstan
Mongolia
China
India
Pakistan
Afghanistan
Brazil
Argentina
Peru
Bolivia
Colombia
Australia
New Zealand
Antarctica
Indonesia
Papua New Guinea
Saudi Arabia
Libya
Algeria
Sudan
Chad
Niger
Mali
Mauritania
Nigeria
Ethiopia
Somalia
Kenya
Tanzania
Angola
Namibia
Botswana
South Africa
Madagascar
Mozambique
Zambia
Zimbabwe
Japan
Sri Langa
Maldives

	Merchandise trade exports $ millions 2009	Merchandise trade imports $ millions 2009	Manufactured exports % of total merchandise exports 2009	High technology exports % of manufactured exports 2009	Current account balance $ millions 2009	Foreign direct investment net inflows $ millions 2009	Net official development assistance[a] $ per capita 2009	External debt Total $ millions 2009	External debt Present value % of GNI[b] 2009	Domestic credit provided by banking sector % of GDP 2009	Net migration thousands 2005–10[c]
Afghanistan	560	3,970	18	..	..	185	204	2,328	5	*2*	1,000
Albania	1,088	4,548	70	1	–1,875	978	113	4,719	31	68	–75
Algeria	45,194	39,294	2	1	..	2,847	9	5,345	3	–9	–140
Angola	40,080	17,000	..	..	–7,572	2,205	13	16,715	24	29	80
Argentina	55.668	38,780	33	9	8,632	3,902	3	120,183	41	28	30
Armenia	698	3,304	33	4	–1,369	777	171	4,935	36	20	–75
Australia	154,234	165,471	19	13	*–47,786*	22,572	..	..	..	144	500
Austria	137,672	143,382	81	11	10,995	8,714	..	..	..	141	160
Azerbaijan	21,097	6,514	3	1	10,178	473	26	4,865	10	23	–50
Bangladesh	15,084	21,833	*88*	*1*	3,345	674	8	23,820	17	60	–570
Belarus	21,283	28,563	48	3	–6,389	1,884	10	17,158	30	34	0
Belgium	369,854	351,945	77[d]	10	3,522	–38,860	..	..	..	119	200
Benin	1,000	2,040	..	..	*–536*	93	76	1,073	12[e]	19	50
Bolivia	4,848	4,410	6	5	813	423	74	5,745	16[e]	50	–100
Bosnia and Herzegovina	3,929	8,773	61	3	–1,175	235	110	9,583	45	58	–10
Brazil	152,995	133,669	39	14	–24,302	25,949	2	276,932	17	97	–229
Bulgaria	16,455	23,330	53	8	–4,751	4,595	..	40,582	85	70	–50
Burkina Faso	850	2,083	12	1	*–1,709*	171	69	1,835	17[e]	15	–65
Burundi	64	402	21	12	–164	0	66	518	13[e]	36	323
Cambodia	4,200	6,200	*96*	*0*	–866	530	49	4,364	38	19	–5
Cameroon	3,000	4,250	..	..	–1,137	340	33	2,941	4[e]	7	–19
Canada	316,713	329,904	50	18	–38,380	19,898	..	..	..	*178*	1,050
Central African Republic	120	300	..	..	..	42	54	396	12[e]	17	5
Chad	2,800	1,950	..	..	..	462	50	1,743	22[e]	8	–75
Chile	53,735	42,427	11	4	4,217	12,7022	5	71,646	43	100	30
China	1,201,534	1,005,688	94	31	297,142	78,193	1	428,442	9	145	–1,731
Hong Kong SAR, China	329,422[g]	352,241	79[g]	31	17,418	52,395	..	..	..	168	113
Colombia	32,853	32,898	28	5	–5,001	7,207	23	52,223	20	37	–120
Congo, Dem. Rep.	3,100	3,600	..	..	..	951	36	12,183	24[e]	7	–100
Congo, Rep.	5,600	2,900	..	..	*–2,181*	2,083	77	5,041	20[e]	–16	–50
Costa Rica	8,788	11,395	47	41	–537	1,347	24	8,070	27	54	30
Côte d'Ivoire	8,900	6,050	15	12	1,670	381	112	11,701	46[e]	23	–145
Croatia	10,474	21,203	66	11	–3,314	2,951	38	..	..	76	10
Czech Republic	113,437	105,179	87	16	–2,147	2,666	..	..	..	62	226
Denmark	93,344	82,947	65	18	11,222	2,905	..	..	..	223	30
Dominican Republic	5,463	12,283	70	5	–2,159	2,067	12	11,003	22	41	–140
Ecuador	13,799	15,093	9	4	–268	316	15	12,930	23	21	–350
Egypt, Arab Rep.	23,062	44,946	*37*	*1*	–3,349	6,712	11	33,257	16	75	–340
El Salvador	3,797	7,255	72	5	–373	431	45	11,384	49	45	–280
Eritrea	15	540	..	..	..	0	29	1,019	34[e]	113	55
Ethiopia	1,596	7,963	9	4	–2,191	221	46	5,025	12[e]	*37*	–300
Finland	62,798	60,753	77	18	6,814	60	..	..	..	99	55
France	484,725	559,817	79	23	–51,857	59,989	..	..	..	130	500
Georgia	1,135	4,378	*55*	*3*	–1,210	658	213	4,231	28	33	–250
Germany	1 126,383	938,295	82	16	165,471	39,153	..	..	..	132	550
Ghana	5,500	8,140	*19*	*1*	–1,198	1,685	66	5,720	27[e]	28	–51
Greece	20,093	59,858	54	11	–35,913	2,419	..	..	..	114	150
Guatemala	7,214	11,531	43	5	8	600	27	13,801	33	37	–200
Guinea	1,010	1,400	*32*	*0*	–403	50	21	2,926	44[e]	..	–300
Haiti	567	2,050	..	..	–232	38	112	1,244	15[e]	26	–140
Honduras	5,196	7,788	35	1	–449	500	61	3,675	13[e]	54	–100
Hungary	83,778	78,175	82	26	–699	2,783	..	..	..	80	75
India	162,613	249,590	67	9	–26,626	34,577	2	237,692	17	69	–1,000
Indonesia	119,481	91,749	41	13	–10,743	4,877	5	157,517	30	37	–730
Iran, Islamic Rep.	78,113	50,375	..	..	..	3,016	1	13,435	4	37	–500
Iraq	39,500	37,000	0	*0*	*27,133*	1,070	89	..	..	–16	–577
Ireland	114,587	62,507	86	25	–6,488	25,233	..	..	..	225	200
Israel	47,935	49,278	94	23	7,592	3,894	..	..	..	78	85
Italy	405,777	412,721	83	8	–66,199	28,976	..	..	..	142	1,650
Japan	580,719	551,960	88	20	142,194	11,834	..	..	..	323	150
Jordan	6,366	14,075	73	1	–1,251	2,382	128	6,615	27	99	250
Kazakhstan	43,196	28,409	14	30	–4,248	13,619	19	109,873	96	55	–100
Kenya	4,421	10,207	37	*5*	–1,661	141	45	8,005	19	45	–189
Korea, Rep.	363,534	323,085	90	32	42,668	1,506	..	..	..	112	–30
Kyrgyz Republic	1,439	3,037	34	5	–102	189	59	2,900	36[e]	*14*	–75
Lao PDR	940	1,260	..	..	9	319	66	5,539	78	*10*	–75
Lebanon	4,187	16,574	72	7	–7,555	4,804	152	24,864	80	163	–13
Liberia	150	552	..	..	–277	218	128	1,660	316[e]	149	248
Libya	35,600	10,150	..	..	9,381	1,711	6	..	..	–66	20
Lithuania	16,452	18,234	55	10	1,646	230	..	31,717	72	70	–100
Madagascar	1,140	3,250	57	2	..	543	23	2,213	17[e]	12	–5
Malawi	920	1,700	9	3	..	60	51	1,093	16[e]	32	–20
Malaysia	157,433	123,832	70	47	31,801	1,387	5	66,390	31	137	130
Mali	2,100	2,644	22	3	*–1,066*	109	76	2,667	14[e]	11	–202
Mauritania	1,370	1,430	*0*	..	..	–38	87	2,029	83[e]	..	10
Mexico	229,637	241,515	76	22	–6,228	14,462	2	192,008	18	44	–2,430

***Source*: The World Bank, 2012**

	Merchandise trade exports $ millions 2009	Merchandise trade imports $ millions 2009	Manufactured exports % of total merchandise exports 2009	High technology exports % of manufactured exports 2009	Current account balance $ millions 2009	Foreign direct investment net inflows $ millions 2009	Net official development assistance[a] $ per capita 2009	External debt Total $ millions 2009	External debt Present value % of GNI[b] 2009	Domestic credit provided by banking sector % of GDP 2009	Net migration thousands 2005–10[c]
Moldova	1,288	3,278	23	5	–465	128	68	3,457	55	41	–172
Morocco	13,863	32,892	65	7	–4,971	1,970	28	23,752	23	100	–425
Mozambique	2,147	3,764	12	10	–1,171	881	88	4,168	18[e]	22	–20
Myanmar	6,710	4,316	..	..	..	323	7	8,186	..	..	–500
Nepal	813	4,392	67	0	–10	38	29	3,633	23	68	–100
Netherlands	498,330	445,496	56	24	36,581	33,287	..	..	..	224	100
New Zealand	24,932	25,545	23	10	–3,624	–1,259	..	..	..	154	50
Nicaragua	1,391	3,477	10	6	–841	434	135	4,420	36[e]	67	–200
Niger	900	1,500	*7*	*8*	*–651*	739	31	991	13[e]	13	–28
Nigeria	52,500	39,000	4	3	21,659	5,787	11	7,846	4	37	–300
Norway	120,880	69,292	20	20	50,122	11,271	..	..	..	..	135
Pakistan	17,680	31,710	76	2	–3,583	2,387	16	53,710	24	48	–1,416
Panama	948	7,801	10	0	–44	1,773	19	12,418	54	84	11
Papua New Guinea	4,328	3,200	..	..	–672	423	61	1,555	18	39	0
Paraguay	3,167	6,940	11	11	86	205	23	4,323	26	25	–40
Peru	26,885	21,706	16	3	247	4,760	15	29,593	23	19	–625
Philippines	38,436	45,878	86	66	8,552	1,948	3	62,911	35	*47*	–900
Poland	134,466	146,626	80	*5*	–9,598	13,796	..	..	..	61	–120
Portugal	43,358	69,844	72	4	–23,952	2,808	..	..	..	195	200
Romania	40,633	54,247	79	10	–7,298	6,310	..	117,511	53	53	–200
Russian Federation	303,388	191,803	17	9	49,365	36,751	..	381,339	26	34	250
Rwanda	193	1,227	19	31	–379	119	93	747	8[e]	..	15
Saudi Arabia	192,296	95,567	8	0	22,765	10,499	*–5*	..	..	1	150
Senegal	2,180	4,713	41	14	*–1,884*	208	81	3,503	20[e]	27	–100
Serbia	8,345	15,582	*66*	..	–2,412	1,921	83	33,402	71	46	0
Sierra Leone	231	520	..	..	–193	74	77	444	20[e]	11	60
Singapore	269,832[g]	245,785	74[g]	49	32,628	16,809	..	..	..	91	500
Slovak Republic	55,980	55,301	87	*5*	–2,810	–31	..	..	..	*54*	20
Somalia	..	..	..	..	..	108	72	2,973	..	..	–250
South Africa	62,603	73,172	47[h]	6	–11,327	5,354	22	42,101	15	184	700
Spain	218,511	287,567	73	*5*	–80,375	6,451	..	..	..	228	1,750
Sri Lanka	7,345	10,207	67	1	–215	404	35	17,208	35	40	–300
Sudan	7,834	9,691	0	34	–3,908	2,682	54	20,139	73[e]	20	135
Sweden	131,243	119,839	76	17	31,460	11,538	..	..	..	145	150
Switzerland	172,850	155,706	90	25	38,972	27,588	..	..	..	191	100
Syrian Arab Republic	10,400	16,300	*33*	*2*	*66*	1,434	12	5,236	9	44	800
Tajikistan	1,009	2,569	..	..	–180	16	59	2,514	39	*27*	–200
Tanzania	3,096	6,347	25	4	–1,816	415	67	7,325	13[e]	18	–300
Thailand	152,498	138,801	75	26	21,861	4,976	–1	58,755	22	137	300
Togo	800	1,500	*62*	*0*	*–222*	50	75	1,640	50[e]	27	–5
Tunisia	14,445	19,096	75	6	–1,234	1,595	45	21,709	54	68	–20
Turkey	102,129	140,921	80	2	–14,410	8,403	18	251,372	35	63	–44
Turkmenistan	6,595	6,750	..	..	..	1,355	8	576	3	..	–25
Uganda	2,478	4,310	27	*1*	–451	604	55	2,490	8[e]	11	–135
Ukraine	39,703	45,436	63	*3*	–1,732	4,816	15	93,153	62	89	–80
United Arab Emirates	175,000	140,000	*4*	*3*	..	..	..	..	..	115	343
United Kingdom	352,491	481,707	72	23	–37,050	72,924	..	..	..	229	948
United States	1,056,043	1,605,296	67	23	–378,435	134,710	..	..	..	232	5,052
Uruguay	5,386	6,907	26	5	215	1,262	15	12,159	37	28	–50
Uzbekistan	10,735	9,023	..	..	..	750	7	4,109	12	..	–400
Venezuela, RB	57,595	40,597	3	4	8,561	–3,105	2	54,503	19	*20*	40
Vietnam	57,096	69,949	*55*	*5*	–6,274	7,600	43	28,674	27	123	–200
West Bank and Gaza	..	..	..	..	*535*	*52*	748	..	..	..	–10
Yemen, Rep.	5,594	8,500	2	0	–2,565	129	21	6,356	17	19	–135
Zambia	4,312	3,793	8	2	–406	699	98	3,049	10[e]	19	–85
Zimbabwe	2,269	2,900	34	1	..	60	59	5,015	..	..	–700
World	**12,491,383t**	**12,592,947t**	**70w**	**20w**		**1,163,758s**	**19w**	**..s**	**..**	**169w**	**..'s**
Low income	63,864	112,493	*56*	*3*		8,168	45	119,100	..	38	–2,536
Middle income	3,740,618	3,544,565	59	20		351,327	11	3,426,014	..	89	–13,415
Lower middle income	724,117	865,722	48	13		92,846	17	904,779	..	57	–7,916
Upper middle income	3,016,877	2,678,489	61	21		258,481	5	2,521,235	..	98	–5,499
Low and middle income	3,804,486	3,656,996	59	20		359,495	22	3,545,114	..	89	–15,951
East Asia & Pacific	1,747,540	1,493,538	80	32		101,428	5	825,602	..	134	–3,781
Europe & Central Asia	657,956	636,419	37	9		86,161	20	1,126,252	..	48	–1,681
Latin America & the Caribbean	677,205	668,496	51	13		76,629	16	912,980	..	67	–5,214
Middle East & North Africa	276,399	289,612	..	*2*		27,766	41	141,321	..	41	–1,089
South Asia	204,760	323,199	68	8		38,414	9	339,983	..	66	–2,376
Sub-Saharan Africa	242,566	253,161	31	6		29,096	53	198,976	..	79	–1,810
High income	8,689,059	8,942,776	73	19		804,263	0	..	..	203	15,895

a.Regional aggregates include data for economies not listed in the table. World and income group totals include aid not allocated by country or region. b. The numerator refers to 2009, whereas the denominator is a three-year average of 2007-09 data. c. Total for the five-year period. d. Includes Luxembourg. e. Data are from debt sustainability analysis for low-income countries. f. Includes Taiwan, China. g. Includes re-exports. h. Data on total exports and imports refer to South Africa only. Data on export commodity shares refer to the South African Customs Union (Botswana, Lesotho, Namibia, and South Africa). i. World total computed by the UN sums to zero, but because the aggregates shown here refer to World Bank definitions, regional and income group totals do not equal zero.