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International Economics

THEORY & POLICY

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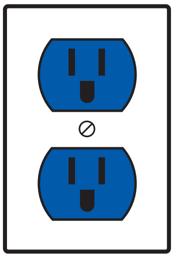

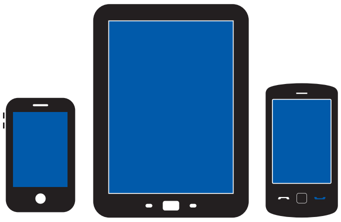

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International Economics

THEORY & POLICY

ELEVENTH EDITION

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For Robin—P.K.
For my family—M.O.
For Clair, Benjamin, and Max—M.M.

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Brief Contents

Contents

Preface

Years after the global financial crisis that broke out in 2007–2008, the world economy is still afflicted by tepid economic growth and, for many people, stagnating incomes. The United States has more or less returned to full employment, but it is growing more slowly than it did before the crisis. Nonetheless, it has been relatively fortunate. Europe's common currency project faces continuing strains and the European Union is itself under stress, given Britain's June 2016 vote to withdraw and a surge in anti-immigration sentiment. Japan continues to face deflation pressures and a sky-high level of public debt. Emerging markets, despite impressive income gains in many cases, remain vulnerable to the ebb and flow of global capital and the ups and downs of world commodity prices. Uncertainty weighs on investment globally, driven not least by worries about the future of the liberal international trade regime built up so painstakingly after World War II.

This eleventh edition therefore comes out at a time when we are more aware than ever before of how events in the global economy influence each country's economic fortunes, policies, and political debates. The world that emerged from World War II was one in which trade, financial, and even communication links between countries were limited. Nearly two decades into the 21st century, however, the picture is very different. Globalization has arrived, big time. International trade in goods and services has expanded steadily over the past six decades thanks to declines in shipping and communication costs, globally negotiated reductions in government trade barriers, the widespread outsourcing of production activities, and a greater awareness of foreign cultures and products. New and better communications technologies, notably the Internet, have revolutionized the way people in all countries obtain and exchange information. International trade in financial assets such as currencies, stocks, and bonds has expanded at a much faster pace even than international product trade. This process brings benefits for owners of wealth but also creates risks of contagious financial instability. Those risks were realized during the recent global financial crisis, which spread quickly across national borders and has played out at huge cost to the world economy. Of all the changes on the international scene in recent decades, however, perhaps the biggest one remains the emergence of China—a development that is already redefining the international balance of economic and political power in the coming century.

Imagine how astonished the generation that lived through the depressed 1930s as adults would have been to see the shape of today's world economy! Nonetheless, the economic concerns that drive international debate have not changed that much from those that dominated the 1930s, nor indeed since they were first analyzed by economists more than two centuries ago. What are the merits of free trade among nations compared with protectionism? What causes countries to run trade surpluses or deficits with their trading partners, and how are such imbalances resolved over time? What causes banking and currency crises in open economies, what causes financial contagion between economies, and how should governments handle international financial instability? How can governments avoid unemployment and inflation, what role do exchange rates play in their efforts, and how can countries best cooperate to achieve their economic goals? As always in international economics, the interplay of events and ideas has led to new modes of analysis. In turn, these analytical advances, however abstruse they may seem at first, ultimately do end up playing a major role in governmental policies, in international negotiations, and in people's everyday lives. Globalization has made citizens of all countries much more aware than ever before of the worldwide economic forces that influence their fortunes, and globalization is here to stay. As we shall see, globalization can be an engine of prosperity, but like any powerful machine it can do damage if managed unwisely. The challenge for the global community is to get the most out of globalization while coping with the challenges that it raises for economic policy.

New to the Eleventh Edition

For this edition as for the last one, we are offering an Economics volume as well as Trade and Finance splits. The goal with these distinct volumes is to allow professors to use the book that best suits their needs based on the topics they cover in their International Economics course. In the Economics volume for a two-semester course, we follow the standard practice of dividing the book into two halves, devoted to trade and to monetary questions. Although the trade and monetary portions of international economics are often treated as unrelated subjects, even within one textbook, similar themes and methods recur in both subfields. We have made it a point to illuminate connections between the trade and monetary areas when they arise. At the same time, we have made sure that the book's two halves are completely self-contained. Thus, a one-semester course on trade theory can be based on Chapters 2 through 12, and a one-semester course on international monetary economics can be based on Chapters 13 through 22. For professors' and students' convenience, however, they can now opt to use either the Trade or the Finance volume, depending on the length and scope of their course.

We have thoroughly updated the content and extensively revised several chapters. These revisions respond both to users' suggestions and to some important developments on the theoretical and practical sides of international economics. The most far-reaching changes are the following:

- **Chapter 4, Specific Factors and Income Distribution** Import competition from developing countries—especially from China—is often singled out in both the press and by politicians as the main culprit for declines in manufacturing employment in the United States. This chapter's case study on trade and unemployment has been significantly expanded and discusses the potential links between these two trends. A new Case Study documents the trend toward greater wage convergence in the European Union following its expansion to the East.
- **Chapter 5, Resources and Trade: The Heckscher-Ohlin Model** Over the past half century, the compensation of capital owners relative to workers has increased in the United States. A new box reviews this evidence and explains why it is best explained by a process of technological change exhibiting capital-skill complementarity rather than by increased trade between the United States and newly industrializing economies.
- **Chapter 6, The Standard Trade Model** A new box discusses some recent evidence showing that the gains from trade have a pro-poor bias—because consumers with relatively lower incomes tend to consume a relatively higher share of their income on goods that are more widely traded.
- **Chapter 8, Firms in the Global Economy: Export Decisions, Outsourcing, and Multinational Enterprises** Increasingly, the goods we consume are produced in "Global Value Chains" that stretch around the world. A new box explains how this recent offshoring trend leads to very misleading statistics for bilateral trade deficits. Using the example of Apple's iPhone 7, the box describes how recorded imports of the iPhone from China (where it is assembled) actually represent imports from many

countries around the world (including the United States) that contribute key components used in the final assembly.

- **Chapter 10**, **The Political Economy of Trade Policy** Recent years have seen some significant setbacks to the march toward freer trade. The revised chapter reviews the failure of the Doha Round of trade negotiations to reach agreement, and the apparent failure of the Trans-Pacific Partnership. A new box discusses “Brexit,” Britain’s startling vote to leave the European Union.
- **Chapter 12, Controversies in Trade Policy** With the backlash against globalization achieving considerable political traction, a new section describes new research suggesting that rapid changes in international trade flows, such as the “China shock” after 2000, have larger adverse effects on workers than previously realized.
- **Chapter 14, Exchange Rates and the Foreign Exchange Market: An Asset Approach** China’s currency, the yuan renminbi, is playing an increasingly important role in world currency markets. But its government has moved only gradually to integrate the local foreign exchange market with global markets, thereby allowing a separate offshore market in yuan to develop outside mainland China’s borders. This chapter features a new box describing the offshore market and the relationship between the onshore and offshore exchange rates.
- **Chapter 17, Output and the Exchange Rate in the Short Run** The chapter includes a new box on the role of invoice currencies in exchange-rate pass-through.
- **Chapter 19, International Monetary Systems: An Historical Overview** The dangers of deflation are outlined in a new box.
- **Chapter 21, Optimum Currency Areas and the Euro** The chapter contains a new box on “Brexit”—the process through which Britain is likely to leave the European Union.
- **Chapter 22, Developing Countries: Growth, Crisis, and Reform** The chapter highlights the key role of commodities in developing-country growth, and the commodity “super cycle.”

In addition to these structural changes, we have updated the book in other ways to maintain current relevance. Thus, we discuss the impact of the North American Free Trade Agreement (NAFTA) on car production in Canada, Mexico, and the United States (and what might happen if the trade agreement were revoked) (Chapter 8); we describe how the U.S. sugar industry has been able to keep the price of sugar in the United States substantially above the world price in recent years (Chapter 9); we discuss the role of negative interest rates in unconventional monetary policy (Chapter 17); and we highlight the increasingly important role of emerging market economies in driving global growth (Chapter 22).

About the Book

The idea of writing this book came out of our experience in teaching international economics to undergraduates and business students since the late 1970s. We perceived two main challenges in teaching. The first was to communicate to students the exciting intellectual advances in this dynamic field. The second was to show how the development of international economic theory has traditionally been shaped by the need to understand the changing world economy and analyze actual problems in international economic policy.

We found that published textbooks did not adequately meet these challenges. Too often, international economics textbooks confront students with a bewildering array of special models and assumptions from which basic lessons are difficult to extract. Because many of these special models are outmoded, students are left puzzled about the real-world relevance of the analysis. As a result, many textbooks often leave a gap between the somewhat antiquated material to be covered in class and the exciting issues that dominate current research and policy debates. That gap has widened dramatically as the importance of international economic problems—and enrollments in international economics courses—have grown.

This book is our attempt to provide an up-to-date and understandable analytical framework for illuminating current events and bringing the excitement of international economics into the classroom. In analyzing both the real and monetary sides of the subject, our approach has been to build up, step by step, a simple, unified framework for communicating the grand traditional insights as well as the newest findings and approaches. To help the student grasp and retain the underlying logic of international economics, we motivate the theoretical development at each stage by pertinent data and policy questions.

The Place of This Book in the Economics Curriculum

Students assimilate international economics most readily when it is presented as a method of analysis vitally linked to events in the world economy, rather than as a body of abstract theorems about abstract models. Our goal has therefore been to stress concepts and their application rather than theoretical formalism. Accordingly, the book does not presuppose an extensive background in economics. Students who have had a course in economic principles will find the book accessible, but students who have taken further courses in microeconomics or macroeconomics will find an abundant supply of new material. Specialized appendices and mathematical postscripts have been included to challenge the most advanced students.

Some Distinctive Features

This book covers the most important recent developments in international economics without shortchanging the enduring theoretical and historical insights that have traditionally formed the core of the subject. We have achieved this comprehensiveness by stressing how recent theories have evolved from earlier findings in response to an evolving world economy. Both the real trade portion of the book (Chapters 2 through 12) and the monetary portion (Chapters 13 through 22) are divided into a core of chapters focused on theory, followed by chapters applying the theory to major policy questions, past and current.

In Chapter 1, we describe in some detail how this book addresses the major themes of international economics. Here we emphasize several of the topics that previous authors failed to treat in a systematic way.

Increasing Returns and Market Structure

Even before discussing the role of comparative advantage in promoting international exchange and the associated welfare gains, we visit the forefront of theoretical and empirical research by setting out the gravity model of trade (Chapter 2). We return to the research frontier (in Chapters 7 and 8) by explaining how increasing returns and product differentiation affect trade and welfare. The models explored in this discussion capture significant aspects of reality, such as intraindustry trade and shifts in trade patterns due to dynamic scale economies. The models show, too, that mutually beneficial trade need not be based on comparative advantage.

Firms in International Trade

Chapter 8 also summarizes exciting new research focused on the role of firms in international trade. The chapter emphasizes that different firms may fare differently in the face of globalization. The expansion of some and the contraction of others shift overall production toward more efficient producers within industrial sectors, raising overall productivity and thereby generating gains from trade. Those firms that expand in an environment of freer trade may have incentives to outsource some of their production activities abroad or take up multinational production, as we describe in the chapter.

Politics and Theory of Trade Policy

Starting in Chapter 4, we stress the effect of trade on income distribution as the key political factor behind restrictions on free trade. This emphasis makes it clear to students why the prescriptions of the standard welfare analysis of trade policy seldom prevail in practice. Chapter 12 explores the popular notion that governments should adopt activist trade policies aimed at encouraging sectors of the economy seen as crucial. The chapter includes a theoretical discussion of such trade policy based on simple ideas from game theory.

Asset Market Approach to Exchange Rate Determination

The modern foreign exchange market and the determination of exchange rates by national interest rates and expectations are at the center of our account of open-economy macroeconomics. The main ingredient of the macroeconomic model we develop is the interest parity relation, augmented later by risk premiums (Chapter 14). Among the topics we address using the model are exchange rate “overshooting”; inflation targeting; behavior of real exchange rates; balance-of-payments crises under fixed exchange rates; and the causes and effects of central bank intervention in the foreign exchange market (Chapters 15 through 18).

International Macroeconomic Policy Coordination

Our discussion of international monetary experience (Chapters 19 through 22) stresses the theme that different exchange rate systems have led to different policy coordination problems for their members. Just as the competitive gold scramble of the interwar years showed how beggar-thy-neighbor policies can be self-defeating, the current float challenges national policymakers to recognize their interdependence and formulate policies cooperatively.

The World Capital Market and Developing Countries

A broad discussion of the world capital market is given in Chapter 20 which takes up the welfare implications of international portfolio diversification as well as problems of prudential supervision of internationally active banks and other financial institutions. Chapter 22 is devoted to the long-term growth prospects and to the specific macroeconomic stabilization and liberalization problems of industrializing and newly industrialized countries. The chapter reviews emerging market crises and places in historical perspective the interactions among developing country borrowers, developed country lenders, and official financial institutions such as the International Monetary

Fund. Chapter 22 also reviews China's exchange-rate policies and recent research on the persistence of poverty in the developing world.

Learning Features

This book incorporates a number of special learning features that will maintain students' interest in the presentation and help them master its lessons.

Case Studies

Case studies that perform the threefold role of reinforcing material covered earlier, illustrating its applicability in the real world, and providing important historical information often accompany theoretical discussions.

Special Boxes

Less central topics that nonetheless offer particularly vivid illustrations of points made in the text are treated in boxes. Among these are U.S. President Thomas Jefferson's trade embargo of 1807–1809 (Chapter 3); the astonishing ability of disputes over banana trade to generate acrimony among countries far too cold to grow any of their own bananas (Chapter 10); the role of currency swap lines among central banks (Chapter 20); and the rapid accumulation of foreign exchange reserves by developing countries (Chapter 22).

Captioned Diagrams

More than 200 diagrams are accompanied by descriptive captions that reinforce the discussion in the text and help the student in reviewing the material.

Learning Goals

A list of essential concepts sets the stage for each chapter in the book. These learning goals help students assess their mastery of the material.

Summary and Key Terms

Each chapter closes with a summary recapitulating the major points. Key terms and phrases appear in boldface type when they are introduced in the chapter and are listed at the end of each chapter. To further aid student review of the material, key terms are italicized when they appear in the chapter summary.

Problems

Each chapter is followed by problems intended to test and solidify students' comprehension. The problems range from routine computational drills to "big picture" questions suitable for classroom discussion. In many problems we ask students to apply what they have learned to real-world data or policy questions.

Further Readings

For instructors who prefer to supplement the textbook with outside readings, and for students who wish to probe more deeply on their own, each chapter has an annotated bibliography that includes established classics as well as up-to-date examinations of recent issues.

MyEconLab

MyEconLab

MyEconLab is the premier online assessment and tutorial system, pairing rich online content with innovative learning tools. MyEconLab includes comprehensive homework, quiz, test, and tutorial options, allowing instructors to manage all assessment needs in one program. Key innovations in the MyEconLab course for the eleventh edition of *International Economics: Theory & Policy* include the following:

- *Real-Time Data Analysis Exercises,* marked with , allow students and instructors to use the latest data from FRED, the online macroeconomic data bank from the Federal Reserve Bank of St. Louis. By completing the exercises, students become familiar with a key data source, learn how to locate data, and develop skills to interpret data.
- The Pearson *Enhanced eText* gives students access to their textbook anytime, anywhere. In addition to note-taking, highlighting, and bookmarking, the Pearson eText offers interactive and sharing features. Students actively read and learn through auto-graded practice, real-time data-graphs, figure animations, author videos, and more. Instructors can share comments or highlights, and students can add their own, for a tight community of learners in any class.
- *Current News Exercises*—Every week, current microeconomic and macroeconomic news articles or videos, with accompanying exercises, are posted to MyEconLab. Assignable and auto-graded, these multi-part exercises ask students to recognize and apply economic concepts to real-world events.

Students and MyEconLab

This online homework and tutorial system puts students in control of their own learning through a suite of study and practice tools correlated with the online, interactive version of the textbook and learning aids such as animated figures. Within MyEconLab's structured environment, students practice what they learn, test their understanding, and then pursue a study plan that MyEconLab generates for them based on their performance.

Instructors and MyEconLab

MyEconLab provides flexible tools that allow instructors easily and effectively to customize online course materials to suit their needs. Instructors can create and assign tests, quizzes, or homework assignments. MyEconLab saves time by automatically grading all questions and tracking results in an online gradebook. MyEconLab can even grade assignments that require students to draw a graph.

After registering for MyEconLab instructors have access to downloadable supplements such as an instructor's manual, PowerPoint lecture notes, and a test bank. The test bank can also be used within MyEconLab, giving instructors ample material from which they can create assignments—or the Custom Exercise Builder makes it easy for instructors to create their own questions.

Weekly news articles, video, and RSS feeds help keep students updated on current events and make it easy for instructors to incorporate relevant news in lectures and homework.

For more information about MyEconLab or to request an instructor access code, visit www.myeconlab.com.

Additional Supplementary Resources

A full range of additional supplementary materials to support teaching and learning accompanies this book.

- The Online Instructor's Manual—updated by Hisham Foad of San Diego State University—includes chapter overviews and answers to the end-of-chapter problems.
- The Online Test Bank offers a rich array of multiple-choice and essay questions, including some mathematical and graphing problems, for each textbook chapter. It is available in Word, PDF, and TestGen formats. This Test Bank was carefully revised and updated by Van Pham of Salem State University.
- The Computerized Test Bank reproduces the Test Bank material in the TestGen software that is available for Windows and Macintosh. With TestGen, instructors can easily edit existing questions, add questions, generate tests, and print the tests in a variety of formats.
- The Online PowerPoint Presentation with Tables, Figures, & Lecture Notes was revised by Amy Glass of Texas A&M University. This resource contains all text figures and tables and can be used for in-class presentations.
- The Companion Web Site at www.pearsonhighered.com/krugman contains additional appendices. (See page xviii of the Contents for a detailed list of the Online Appendices.)

Instructors can download supplements from our secure Instructor's Resource Center. Please visit www.pearsonhighered.com/irc.

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Although we have not been able to make each and every suggested change, we found reviewers' observations invaluable in revising the book. Obviously, we bear sole responsibility for its remaining shortcomings.

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January 2017

CHAPTER 1

INTRODUCTION

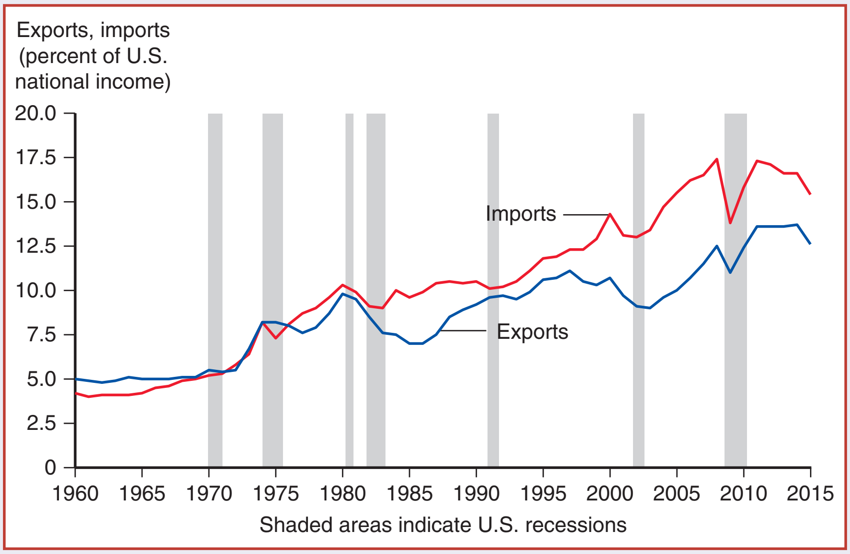
You could say that the study of international trade and finance is where the discipline of economics as we know it began. Historians of economic thought often describe the essay "Of the Balance of Trade" by the Scottish philosopher David Hume as the first real exposition of an economic model. Hume published his essay in 1758, almost 20 years before his friend Adam Smith published *The Wealth of Nations*. And the debates over British trade policy in the early 19th century did much to convert economics from a discursive, informal field to the model-oriented subject it has been ever since.

Yet the study of international economics has never been as important as it is now. In the early 21st century, nations are more closely linked than ever before through trade in goods and services, flows of money, and investment in each other's economies. And the global economy created by these linkages is a turbulent place: Both policy makers and business leaders in every country, including the United States, must now pay attention to what are sometimes rapidly changing economic fortunes halfway around the world.

A look at some basic trade statistics gives us a sense of the unprecedented importance of international economic relations. Figure 1-1 shows the levels of U.S. exports and imports as shares of gross domestic product from 1960 to 2015. The most obvious feature of the figure is the long-term upward trend in both shares: International trade has roughly tripled in importance compared with the economy as a whole.

Almost as obvious is that, while both imports and exports have increased, imports have grown more, leading to a large excess of imports over exports. How is the United States able to pay for all those imported goods? The answer is that the money is supplied by large inflows of capital—money invested by foreigners willing to take a stake in the U.S. economy. Inflows of capital on that scale would once have been inconceivable; now they are taken for granted. And so the gap between imports and exports is an indicator of another aspect of growing international linkages—in this case the growing linkages between national capital markets.

Finally, notice that both imports and exports took a plunge in 2009. This decline reflected the global economic crisis that began in 2008 and is a reminder of the close links between world trade and the overall state of the world economy.



MyEconLab Real-time data

FIGURE 1-1

Exports and Imports as a Percentage of U.S. National Income (Shaded areas indicate U.S. recessions.)

Both imports and exports have risen as a share of the U.S. economy, but imports have risen more.

Source: U.S. Bureau of Economic Analysis, 2015. research.stlouisfed.org

If international economic relations have become crucial to the United States, they are even more crucial to other nations. Figure 1-2 shows the average of imports and exports as a share of GDP for a sample of countries. The United States, by virtue of its size and the diversity of its resources, relies less on international trade than almost any other country.

This text introduces the main concepts and methods of international economics and illustrates them with applications drawn from the real world. Much of the text is devoted to old ideas that are still as valid as ever: The 19th-century trade theory of David Ricardo and even the 18th-century monetary analysis of David Hume remain highly relevant to the 21st-century world economy. At the same time, we have made a special effort to bring the analysis up to date. In particular, the economic crisis that began in 2007 threw up major new challenges for the global economy. Economists were able to apply existing analyses to some of these challenges, but they were also forced to rethink some important concepts. Furthermore, new approaches have emerged to old questions, such as the impacts of changes in monetary and fiscal policy. We have attempted to convey the key ideas that have emerged in recent research while stressing the continuing usefulness of old ideas.

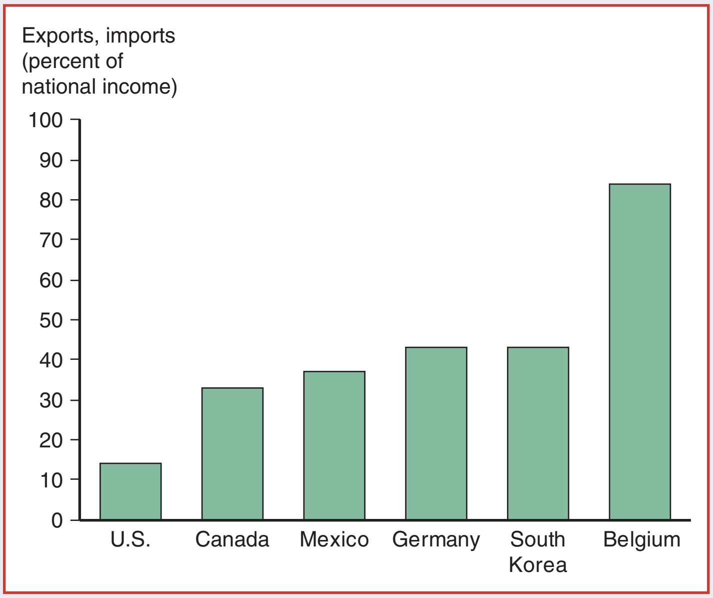


FIGURE 1-2

Average of Exports and Imports as Percentages of National Income in 2015

International trade is even more important to most other countries than it is to the United States.

Source: World Bank.

LEARNING GOALS

After reading this chapter, you will be able to:

- Distinguish between international and domestic economic issues.
- Explain why seven themes recur in international economics, and discuss their significance.
- Distinguish between the trade and monetary aspects of international economics.

What Is International Economics About?

International economics uses the same fundamental methods of analysis as other branches of economics because the motives and behavior of individuals are the same in international trade as they are in domestic transactions. Gourmet food shops in Florida sell coffee beans from both Mexico and Hawaii; the sequence of events that brought those beans to the shop is not very different, and the imported beans traveled a much shorter distance than the beans shipped within the United States! Yet international economics involves new and different concerns because international trade and investment occur between independent nations. The United States and Mexico are sovereign states; Florida and Hawaii are not. Mexico's coffee shipments to Florida could be disrupted if the U.S. government imposed a quota that limits imports; Mexican coffee could suddenly become cheaper to U.S. buyers if the peso were to fall in value against the dollar. By contrast, neither of those events can happen in commerce within the United States because the Constitution forbids restraints on interstate trade and all U.S. states use the same currency.

The subject matter of international economics, then, consists of issues raised by the special problems of economic interaction between sovereign states. Seven themes recur throughout the study of international economics: (1) the gains from trade, (2) the pattern of trade, (3) protectionism, (4) the balance of payments, (5) exchange rate determination, (6) international policy coordination, and (7) the international capital market.

The Gains from Trade

Everybody knows that some international trade is beneficial—for example, nobody thinks that Norway should grow its own oranges. Many people are skeptical, however, about the benefits of trading for goods that a country could produce for itself. Shouldn't Americans buy American goods whenever possible to help create jobs in the United States?

Probably the most important single insight in all of international economics is that there are *gains from trade*—that is, when countries sell goods and services to each other, this exchange is almost always to their mutual benefit. The range of circumstances under which international trade is beneficial is much wider than most people imagine. For example, it is a common misconception that trade is harmful if large disparities exist between countries in productivity or wages. On one side, businesspeople in less technologically advanced countries, such as India, often worry that opening their economies to international trade will lead to disaster because their industries won't be able to compete. On the other side, people in technologically advanced nations where workers earn high wages often fear that trading with less advanced, lower-wage countries will drag their standard of living down—one presidential candidate memorably warned of a "giant sucking sound" if the United States were to conclude a free trade agreement with Mexico.

Yet the first model this text presents of the causes of trade (Chapter 3) demonstrates that two countries can trade to their mutual benefit even when one of them is more efficient than the other at producing everything and when producers in the less-efficient country can compete only by paying lower wages. We'll also see that trade provides benefits by allowing countries to export goods whose production makes relatively heavy use of resources that are locally abundant while importing goods whose production makes heavy use of resources that are locally scarce (Chapter 5). International trade also allows countries to specialize in producing narrower ranges of goods, giving them greater efficiencies of large-scale production.

Nor are the benefits of international trade limited to trade in tangible goods. International migration and international borrowing and lending are also forms of mutually beneficial trade—the first a trade of labor for goods and services (Chapter 4), the second a trade of current goods for the promise of future goods (Chapter 6). Finally, international exchanges of risky assets such as stocks and bonds can benefit all countries by allowing each country to diversify its wealth and reduce the variability of its income (Chapter 20). These invisible forms of trade yield gains as real as the trade that puts fresh fruit from Latin America in Toronto markets in February.

Although nations generally gain from international trade, it is quite possible that international trade may hurt particular groups *within* nations—in other words, that international trade will have strong effects on the distribution of income. The effects of trade on income distribution have long been a concern of international trade theorists who have pointed out that:

> International trade can adversely affect the owners of resources that are "specific" to industries that compete with imports, that is, cannot find alternative employment in other industries. Examples would include specialized machinery, such as power looms made less valuable by textile imports, and workers with specialized skills, like fishermen who find the value of their catch reduced by imported seafood.
>
> Trade can also alter the distribution of income between broad groups, such as workers and the owners of capital.

These concerns have moved from the classroom into the center of real-world policy debate as it has become increasingly clear that the real wages of less-skilled workers in the United States have been declining—even though the country as a whole is continuing to grow richer. Many commentators attribute this development to growing international trade, especially the rapidly growing exports of manufactured goods from low-wage countries. Assessing this claim has become an important task for international economists and is a major theme of Chapters 4 through 6.

The Pattern of Trade

Economists cannot discuss the effects of international trade or recommend changes in government policies toward trade with any confidence unless they know their theory is good enough to explain the international trade that is actually observed. As a result, attempts to explain the pattern of international trade—who sells what to whom—have been a major preoccupation of international economists.

Some aspects of the pattern of trade are easy to understand. Climate and resources clearly explain why Brazil exports coffee and Saudi Arabia exports oil. Much of the pattern of trade is more subtle, however. Why does Japan export automobiles, while the United States exports aircraft? In the early 19th century, English economist David Ricardo offered an explanation of trade in terms of international differences in labor productivity, an explanation that remains a powerful insight (Chapter 3). In the 20th century, however, alternative explanations also were proposed. One of the most influential explanations links trade patterns to an interaction between the relative supplies of national resources such as capital, labor, and land on one side and the relative use of these factors in the production of different goods on the other. We present this theory in Chapter 5. We then discuss how this basic model must be extended in order to generate accurate empirical predictions for the volume and pattern of trade. Also, some international economists have proposed theories that suggest a substantial random component, along with economies of scale, in the pattern of international trade, theories that are developed in Chapters 7 and 8.

How Much Trade?

If the idea of gains from trade is the most important theoretical concept in international economics, the seemingly eternal debate over how much trade to allow is its most important policy theme. Since the emergence of modern nation-states in the 16th century, governments have worried about the effect of international competition on the prosperity of domestic industries and have tried either to shield industries from foreign competition by placing limits on imports or to help them in world competition by subsidizing exports. The single most consistent mission of international economics has been to analyze the effects of these so-called protectionist policies—and usually, though not always, to criticize protectionism and show the advantages of freer international trade.

The debate over how much trade to allow took a new direction in the 1990s. After World War II the advanced democracies, led by the United States, pursued a broad policy of removing barriers to international trade; this policy reflected the view that free trade was a force not only for prosperity but also for promoting world peace. In the first half of the 1990s, several major free trade agreements were negotiated. The most notable were the North American Free Trade Agreement (NAFTA) between the United States, Canada, and Mexico, approved in 1993, and the so-called Uruguay Round agreement, which established the World Trade Organization in 1994.

Since then, however, there has been considerable backlash against "globalization." In 2016, Britain shocked the political establishment by voting to leave the European Union, which guarantees free movement of goods and people among its members. In that same year, claims that competition from imports and unfair trade deals have cost jobs played an important role in the U.S. presidential campaign. One consequence of this anti-globalization backlash is that free trade advocates are under greater pressure than ever before to find ways to explain their views.

As befits both the historical importance and the current relevance of the protectionist issue, roughly a quarter of this text is devoted to this subject. Over the years, international economists have developed a simple yet powerful analytical framework for determining the effects of government policies that affect international trade. This framework helps predict the effects of trade policies, while also allowing for cost-benefit analysis and defining criteria for determining when government intervention is good for the economy. We present this framework in Chapters 9 and 10 and use it to discuss a number of policy issues in those chapters and in Chapters 11 and 12.

In the real world, however, governments do not necessarily do what the cost-benefit analysis of economists tells them they should. This does not mean that analysis is useless. Economic analysis can help make sense of the politics of international trade policy by showing who benefits and who loses from such government actions as quotas on imports and subsidies to exports. The key insight of this analysis is that conflicts of interest *within* nations are usually more important in determining trade policy than conflicts of interest *between* nations. Chapters 4 and 5 show that trade usually has very strong effects on income distribution within countries, while Chapters 10 through 12 reveal that the relative power of different interest groups within countries, rather than some measure of overall national interest, is often the main determining factor in government policies toward international trade.

Balance of Payments

In 1998, both China and South Korea ran large trade surpluses of about $40 billion each. In China's case, the trade surplus was not out of the ordinary—the country had been running large surpluses for several years, prompting complaints from other countries, including the United States, that China was not playing by the rules. So is it good to run a trade surplus and bad to run a trade deficit? Not according to the South Koreans: Their trade surplus was forced on them by an economic and financial crisis, and they bitterly resented the necessity of running that surplus.

This comparison highlights the fact that a country's *balance of payments* must be placed in the context of an economic analysis to understand what it means. It emerges in a variety of specific contexts: in discussing foreign direct investment by multinational corporations (Chapter 8), in relating international transactions to national income accounting (Chapter 13), and in discussing virtually every aspect of international monetary policy (Chapters 17 through 22). Like the problem of protectionism, the balance of payments has become a central issue for the United States because the nation has run huge trade deficits every year since 1982.

Exchange Rate Determination

In September 2010, Brazil's finance minister, Guido Mantegna, made headlines by declaring that the world was "in the midst of an international currency war." The occasion for his remarks was a sharp rise in the value of Brazil's currency, the *real*, which was worth less than 45 cents at the beginning of 2009 but had risen to almost 60 cents when he spoke (and would rise to 65 cents over the next few months). Mantegna accused wealthy countries—the United States in particular—of engineering this rise, which was devastating to Brazilian exporters. However, the surge in the *real* proved short-lived; the currency began dropping in mid-2011, and by the summer of 2013 it was back down to only 45 cents.

A key difference between international economics and other areas of economics is that countries usually have their own currencies—the euro, which is shared by a number of European countries, being the exception that proves the rule. And as the example of the *real* illustrates, the relative values of currencies can change over time, sometimes drastically.

For historical reasons, the study of exchange rate determination is a relatively new part of international economics. For much of modern economic history, exchange rates were fixed by government action rather than determined in the marketplace. Before World War I, the values of the world's major currencies were fixed in terms of gold; for a generation after World War II, the values of most currencies were fixed in terms of the U.S. dollar. The analysis of international monetary systems that fix exchange rates remains an important subject. Chapter 18 is devoted to the working of fixed-rate systems, Chapter 19 to the historical performance of alternative exchange-rate systems, and Chapter 21 to the economics of currency areas such as the European monetary union. For the time being, however, some of the world's most important exchange rates fluctuate minute by minute and the role of changing exchange rates remains at the center of the international economics story. Chapters 14 through 17 focus on the modern theory of floating exchange rates.

International Policy Coordination

The international economy comprises sovereign nations, each free to choose its own economic policies. Unfortunately, in an integrated world economy, one country's economic policies usually affect other countries as well. For example, when Germany's Bundesbank raised interest rates in 1990—a step it took to control the possible inflationary impact of the reunification of West and East Germany—it helped precipitate a recession in the rest of Western Europe. Differences in goals among countries often lead to conflicts of interest. Even when countries have similar goals, they may suffer losses if they fail to coordinate their policies. A fundamental problem in international economics is determining how to produce an acceptable degree of harmony among the international trade and monetary policies of different countries in the absence of a world government that tells countries what to do.

For almost 70 years, international trade policies have been governed by an international agreement known as the General Agreement on Tariffs and Trade (GATT). Since 1994, trade rules have been enforced by an international organization, the World Trade Organization, that can tell countries, including the United States, that their policies violate prior agreements. We discuss the rationale for this system in Chapter 9 and look at whether the current rules of the game for international trade in the world economy can or should survive.

While cooperation on international trade policies is a well-established tradition, coordination of international macroeconomic policies is a newer and more uncertain topic. Attempts to formulate principles for international macroeconomic coordination date to the 1980s and 1990s and remain controversial to this day. Nonetheless, attempts at international macroeconomic coordination are occurring with growing frequency in the real world. Both the theory of international macroeconomic coordination and the developing experience are reviewed in Chapter 19.

The International Capital Market

In 2007, investors who had bought U.S. mortgage-backed securities—claims on the income from large pools of home mortgages—received a rude shock: As home prices began to fall, mortgage defaults soared, and investments they had been assured were safe turned out to be highly risky. Since many of these claims were owned by financial institutions, the housing bust soon turned into a banking crisis. And here's the thing: It wasn't just a U.S. banking crisis, because banks in other countries, especially in Europe, had also bought many of these securities.

The story didn't end there: Europe soon had its own housing bust. And while the bust mainly took place in southern Europe, it soon became apparent that many northern European banks—such as German banks that had lent money to their Spanish counterparts—were also very exposed to the financial consequences.

In any sophisticated economy, there is an extensive capital market: a set of arrangements by which individuals and firms exchange money now for promises to pay in the future. The growing importance of international trade since the 1960s has been accompanied by a growth in the *international* capital market, which links the capital markets of individual countries. Thus in the 1970s, oil-rich Middle Eastern nations placed their oil revenues in banks in London or New York, and these banks in turn lent money to governments and corporations in Asia and Latin America. During the 1980s, Japan converted much of the money it earned from its booming exports into investments in the United States, including the establishment of a growing number of U.S. subsidiaries of Japanese corporations. Nowadays, China is funneling its own export earnings into a range of foreign assets, including dollars that its government holds as international reserves.

International capital markets differ in important ways from domestic capital markets. They must cope with special regulations that many countries impose on foreign investment; they also sometimes offer opportunities to evade regulations placed on domestic markets. Since the 1960s, huge international capital markets have arisen, most notably the remarkable London Eurodollar market, in which billions of dollars are exchanged each day without ever touching the United States.

Some special risks are associated with international capital markets. One risk is currency fluctuations: If the euro falls against the dollar, U.S. investors who bought euro bonds suffer a capital loss. Another risk is national default: A nation may simply refuse to pay its debts (perhaps because it cannot), and there may be no effective way for its creditors to bring it to court. Fears of default by highly indebted European nations have been a major concern in recent years.

The growing importance of international capital markets and their new problems demand greater attention than ever before. This text devotes two chapters to issues arising from international capital markets: one on the functioning of global asset markets (Chapter 20) and one on foreign borrowing by developing countries (Chapter 22).

International Economics: Trade and Money

The economics of the international economy can be divided into two broad subfields: the study of *international trade* and the study of *international money.* International trade analysis focuses primarily on the *real* transactions in the international economy, that is, transactions involving a physical movement of goods or a tangible commitment of economic resources. International monetary analysis focuses on the *monetary* side of the international economy, that is, on financial transactions such as foreign purchases of U.S. dollars. An example of an international trade issue is the conflict between the United States and Europe over Europe's subsidized exports of agricultural products; an example of an international monetary issue is the dispute over whether the foreign exchange value of the dollar should be allowed to float freely or be stabilized by government action.

In the real world, there is no simple dividing line between trade and monetary issues. Most international trade involves monetary transactions, while, as the examples in this chapter already suggest, many monetary events have important consequences for trade. Nonetheless, the distinction between international trade and international money is useful. The first half of this text covers international trade issues. Part One (Chapters 2 through 8) develops the analytical theory of international trade, and Part Two (Chapters 9 through 12) applies trade theory to the analysis of government policies toward trade. The second half of the text is devoted to international monetary issues. Part Three (Chapters 13 through 18) develops international monetary theory, and Part Four (Chapters 19 through 22) applies this analysis to international monetary policy.

CHAPTER 2

World Trade: An Overview

In 2015, the world as a whole produced goods and services worth about $74 trillion at current prices. Of this total, about 30 percent was sold across national borders: World trade in goods and services exceeded $21 trillion. That's a whole lot of exporting and importing.

In later chapters, we'll analyze why countries sell much of what they produce to other countries and why they purchase much of what they consume from other countries. We'll also examine the benefits and costs of international trade and the motivations for and effects of government policies that restrict or encourage trade.

Before we get to all that, however, let's begin by describing who trades with whom. An empirical relationship known as the *gravity model* helps to make sense of the value of trade between any pair of countries and sheds light on the impediments that continue to limit international trade even in today's global economy.

We'll then turn to the changing structure of world trade. As we'll see, recent decades have been marked by a large increase in the share of world output sold internationally, by a shift in the world's economic center of gravity toward Asia, and by major changes in the types of goods that make up that trade.

LEARNING GOALS

After reading this chapter, you will be able to:

- Describe how the value of trade between any two countries depends on the size of these countries' economies and explain the reasons for that relationship.
- Discuss how distance and borders reduce trade.
- Describe how the share of international production that is traded has fluctuated over time and why there have been two ages of globalization.
- Explain how the mix of goods and services that are traded internationally has changed over time.

Who Trades with Whom?

Figure 2-1 shows the total value of trade in goods—exports plus imports—between the United States and its top 15 trading partners in 2015. (Data on trade in services are less well broken down by trading partner; we'll talk about the rising importance of trade in

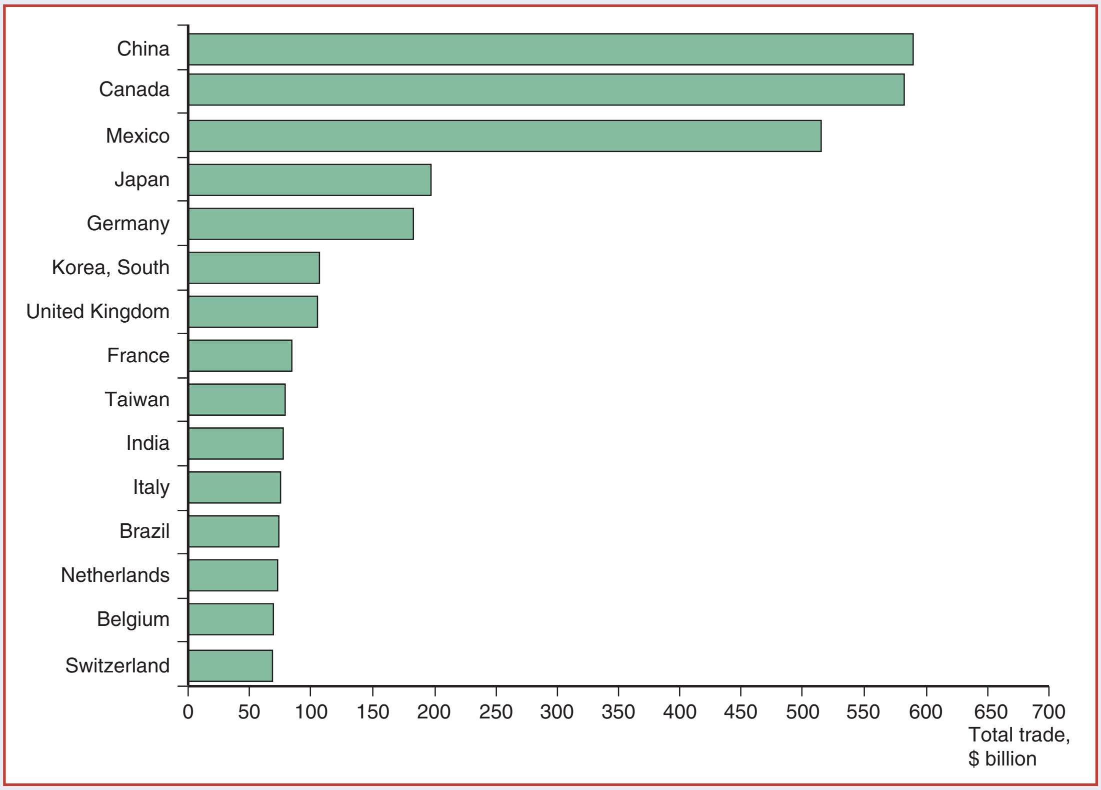


FIGURE 2-1

Total U.S. Trade with Major Partners, 2015

U.S. trade—measured as the sum of imports and exports—is mostly with 15 major partners.

Source: U.S. Department of Commerce.

services, and the issues raised by that trade, later in this chapter.) Taken together, these 15 countries accounted for 75 percent of the value of U.S. trade in that year.

Why did the United States trade so much with these countries? Let's look at the factors that, in practice, determine who trades with whom.

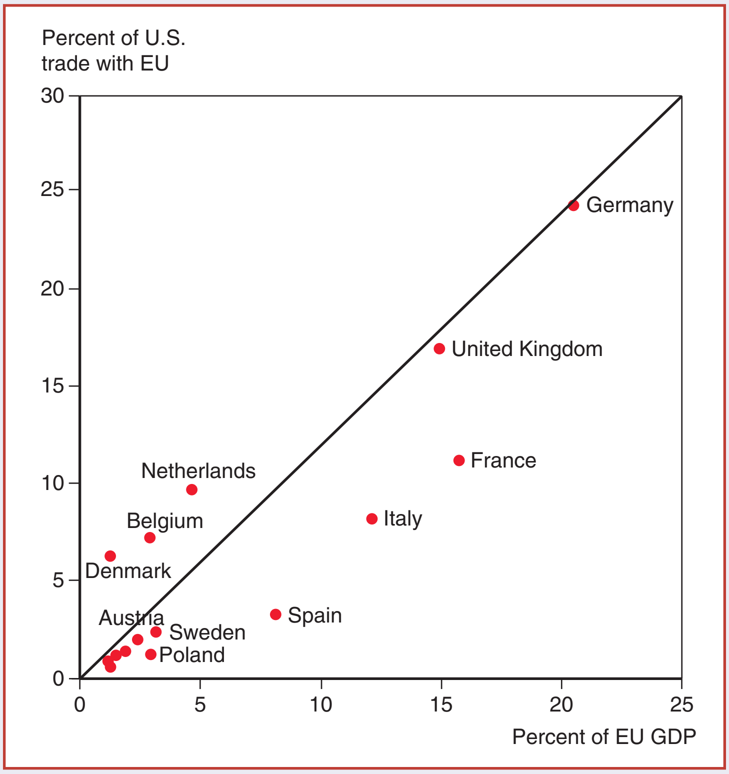
Size Matters: The Gravity Model

Three of the top 15 U.S. trading partners are European nations: Germany, the United Kingdom, and France. Why does the United States trade more heavily with these three European countries than with others? The answer is that these are the three largest European economies. That is, they have the highest values of **gross domestic product (GDP),** which measures the total value of all goods and services produced in an economy. There is a strong empirical relationship between the size of a country's economy and the volume of both its imports and its exports.

Figure 2-2 illustrates this relationship by showing the correspondence between the size of different European economies—specifically, America's 15 most important

FIGURE 2-2
The Size of European Economies and the Value of Their Trade with the United States

Source: U.S. Department of Commerce, European Commission.



Western European trading partners in 2012—and those countries' trade with the United States in that year. On the horizontal axis is each country's GDP, expressed as a percentage of the total GDP of the European Union; on the vertical axis is each country's share of the total trade of the United States with the EU. As you can see, the scatter of points is clustered around the dotted 45-degree line—that is, each country's share of U.S. trade with Europe was roughly equal to that country's share of Western European GDP. Germany has a large economy, accounting for 20 percent of Western European GDP; it also accounts for 24 percent of U.S. trade with the region. Sweden has a much smaller economy, accounting for only 3.2 percent of European GDP; correspondingly, it accounts for only 2.3 percent of U.S.–Europe trade.

Looking at world trade as a whole, economists have found that an equation of the following form predicts the volume of trade between any two countries fairly accurately,

$$T_{ij} = A \times Y_i \times Y_j / D_{ij}, \qquad (2\text{-}1)$$

where A is a constant term, T_{ij} is the value of trade between country i and country j, Y_i is country i's GDP, Y_j is country j's GDP, and D_{ij} is the distance between the two countries. That is, the value of trade between any two countries is proportional, other things equal, to the *product* of the two countries' GDPs and diminishes with the distance between the two countries.

An equation such as (2-1) is known as a **gravity model** of world trade. The reason for the name is the analogy to Newton's law of gravity: Just as the gravitational attraction between any two objects is proportional to the product of their masses and diminishes with distance, the trade between any two countries is, other things equal, proportional to the product of their GDPs and diminishes with distance.

Economists often estimate a somewhat more general gravity model of the following form:

$$T_{ij} = A \times Y_i^a \times Y_j^b / D_{ij}^c. \qquad \text{(2-2)}$$

This equation says that the three things that determine the volume of trade between two countries are the size of the two countries' GDPs and the distance between the countries, without specifically assuming that trade is proportional to the product of the two GDPs and inversely proportional to distance. Instead, a, b, and c are chosen to fit the actual data as closely as possible. If a, b, and c were all equal to 1, equation (2-2) would be the same as equation (2-1). In fact, estimates often find that (2-1) is a pretty good approximation.

Why does the gravity model work? Broadly speaking, large economies tend to spend large amounts on imports because they have large incomes. They also tend to attract large shares of other countries' spending because they produce a wide range of products. So, other things equal, the trade between any two economies is larger—the larger is *either* economy.

What other things *aren't* equal? As we have already noted, in practice countries spend much or most of their income at home. The United States and the European Union each account for about 25 percent of the world's GDP, but each attracts only about 2 percent of the other's spending. To make sense of actual trade flows, we need to consider the factors limiting international trade. Before we get there, however, let's look at an important reason why the gravity model is useful.

Using the Gravity Model: Looking for Anomalies

It's clear from Figure 2-2 that a gravity model fits the data on U.S. trade with European countries pretty well—but not perfectly. In fact, one of the principal uses of gravity models is that they help us to identify anomalies in trade. Indeed, when trade between two countries is either much more or much less than a gravity model predicts, economists search for the explanation.

Looking again at Figure 2-2, we see that the Netherlands, Belgium, and Ireland trade considerably more with the United States than a gravity model would have predicted. Why might this be the case?

For Ireland, the answer lies partly in cultural affinity: Not only does Ireland share a language with the United States, but tens of millions of Americans are descended from Irish immigrants. Beyond this consideration, Ireland plays a special role as host to many U.S.-based corporations; we'll discuss the role of such *multinational corporations* in Chapter 8.

In the case of both the Netherlands and Belgium, geography and transport costs probably explain their large trade with the United States. Both countries are located near the mouth of the Rhine, Western Europe's longest river, which runs past the Ruhr, Germany's industrial heartland. So the Netherlands and Belgium have traditionally been the point of entry to much of northwestern Europe; Rotterdam in the Netherlands is the most important port in Europe, as measured by the tonnage handled, and Antwerp in Belgium ranks second. The large trade of Belgium and the Netherlands suggests, in other words, an important role of transport costs and geography in determining the volume of trade. The importance of these factors is clear when we turn to a broader example of trade data.

Impediments to Trade: Distance, Barriers, and Borders

Figure 2-3 shows the same data as Figure 2-2—U.S. trade as a percentage of total trade with Western Europe in 2012 versus GDP as a percentage of the region's total GDP—but adds two more countries: Canada and Mexico. As you can see, the two neighbors of the United States do a lot more trade with the United States than European economies of equal size. In fact, Canada, whose economy is roughly the same size as Spain's, trades as much with the United States as all of Europe does.

Why does the United States do so much more trade with its North American neighbors than with its European partners? One main reason is the simple fact that Canada and Mexico are much closer.

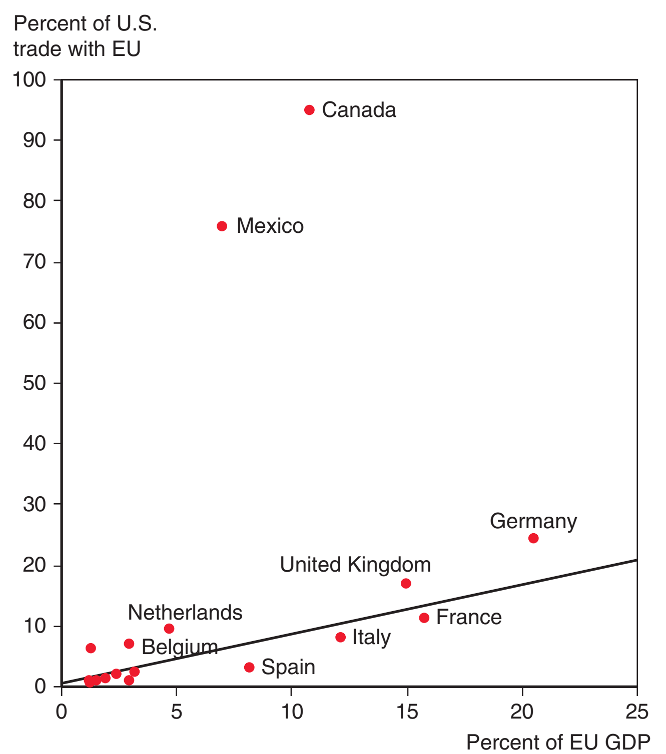
All estimated gravity models show a strong negative effect of distance on international trade; typical estimates say that a 1 percent increase in the distance between two countries is associated with a fall of 0.7 to 1 percent in the trade between those countries. This drop partly reflects increased costs of transporting goods and services. Economists also believe that less tangible factors play a crucial role: Trade tends to be intense when countries have close personal contact, and this contact tends to diminish when distances are large. For example, it's easy for a U.S. sales representative to pay a quick visit to Toronto, but it's a much bigger project for that representative to go to Paris. Unless the company is based on the West Coast, it's an even bigger project to visit Tokyo.

FIGURE 2-3

Economic Size and Trade with the United States

The United States does markedly more trade with its neighbors than it does with European economies of the same size.

Source: U.S. Department of Commerce, European Commission.



In addition to being U.S. neighbors, Canada and Mexico are part of a **trade agreement** with the United States, the North American Free Trade Agreement, or NAFTA, which ensures that most goods shipped among the three countries are not subject to tariffs or other barriers to international trade. We'll analyze the effects of barriers to international trade in Chapters 8 and 9, and the role of trade agreements such as NAFTA in Chapter 10. For now, let's notice that economists use gravity models as a way of assessing the impact of trade agreements on actual international trade: If a trade agreement is effective, it should lead to significantly more trade among its partners than one would otherwise predict given their GDPs and distances from one another.

It's important to note, however, that although trade agreements often end all formal barriers to trade between countries, they rarely make national borders irrelevant. Even when most goods and services shipped across a national border pay no tariffs and face few legal restrictions, there is much more trade between regions of the same country than between equivalently situated regions in different countries. The Canadian–U.S. border is a case in point. The two countries are part of a free trade agreement (indeed, there was a Canadian–U.S. free trade agreement even before NAFTA); most Canadians speak English; and the citizens of either country are free to cross the border with a minimum of formalities. Yet data on the trade of individual Canadian provinces both with each other and with U.S. states show that, other things equal, there is much more trade between provinces than between provinces and U.S. states.

Table 2-1 illustrates the extent of the difference. It shows the total trade (exports plus imports) of the Canadian province of British Columbia, just north of the state of Washington, with other Canadian provinces and with U.S. states, measured as a percentage of each province or state's GDP. Figure 2-4 shows the location of these provinces and states. Each Canadian province is paired with a U.S. state that is roughly the same distance from British Columbia: Washington State and Alberta both border British Columbia; Ontario and Ohio are both in the Midwest; and so on. With the exception of trade with the far eastern Canadian province of New Brunswick, intra-Canadian trade drops off steadily with distance. But in each case, the trade between British Columbia and a Canadian province is much larger than trade with an equally distant U.S. state.

Economists have used data like those shown in Table 2-1, together with estimates of the effect of distance in gravity models, to calculate that the Canadian–U.S. border, although it is one of the most open borders in the world, has as much effect in deterring trade as if the countries were between 1,500 and 2,500 miles apart.

Why do borders have such a large negative effect on trade? That is a topic of ongoing research. Chapter 21 describes one recent focus of that research: an effort to determine

TABLE 2-1 Trade with British Columbia, as Percent of GDP, 2009

Canadian Province	Trade as Percent of GDP	Trade as Percent of GDP	U.S. State at Similar Distance from British Columbia
Alberta	6.9	2.6	Washington
Saskatchewan	2.4	1.0	Montana
Manitoba	2.0	0.3	California
Ontario	1.9	0.2	Ohio
Quebec	1.4	0.1	New York
New Brunswick	2.3	0.2	Maine

Source: Statistics Canada, U.S. Department of Commerce.

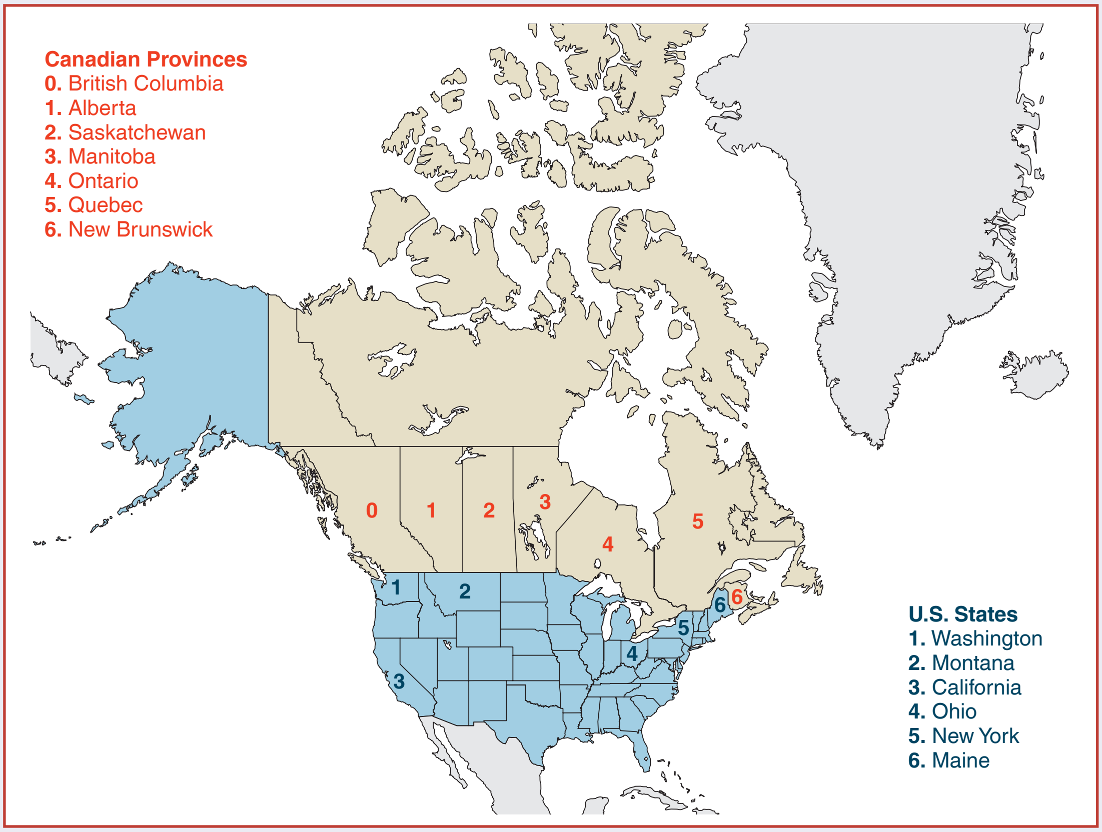


FIGURE 2-4

Canadian Provinces and U.S. States That Trade with British Columbia

Source: Statistics Canada, U.S. Department of Commerce.

how much effect the existence of separate national currencies has on international trade in goods and services.

The Changing Pattern of World Trade

World trade is a moving target. The direction and composition of world trade is quite different today from what it was a generation ago and even more different from what it was a century ago. Let's look at some of the main trends.

Has the World Gotten Smaller?

In popular discussions of the world economy, one often encounters statements that modern transportation and communications have abolished distance, so that the world has become a small place. There's clearly some truth to these statements: The Internet makes instant and almost free communication possible between people thousands of miles apart, while jet transport allows quick physical access to all parts of the globe. On the other hand, gravity models continue to show a strong negative relationship between distance and international trade. But have such effects grown weaker over time? Has the progress of transportation and communication made the world smaller?

The answer is yes—but history also shows that political forces can outweigh the effects of technology. The world got smaller between 1840 and 1914, but it got bigger again for much of the 20th century.

Economic historians tell us that a global economy, with strong economic linkages between even distant nations, is not new. In fact, there have been two great waves of globalization with the first wave relying not on jets and the Internet but on railroads, steamships, and the telegraph. In 1919, the great economist John Maynard Keynes described the results of that surge of globalization:

> What an extraordinary episode in the economic progress of man that age was which came to an end in August 1914! . . . The inhabitant of London could order by telephone, sipping his morning tea in bed, the various products of the whole earth, in such quantity as he might see fit, and reasonably expect their early delivery upon his doorstep.

Notice, however, Keynes's statement that the age "came to an end" in 1914. In fact, two subsequent world wars, the Great Depression of the 1930s and widespread protectionism, did a great deal to depress world trade. Figure 2-5 shows one measure

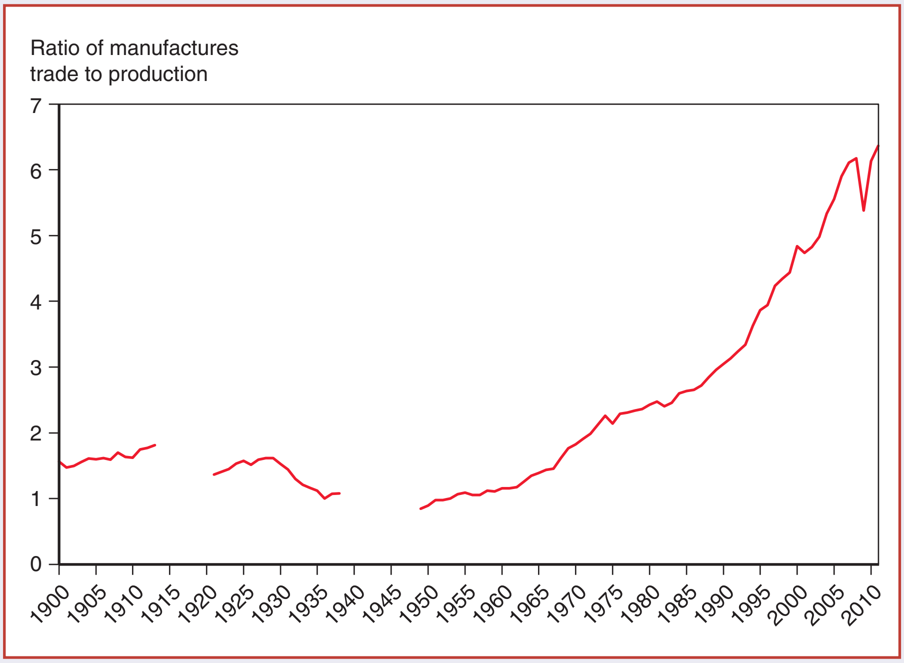


FIGURE 2-5

The Fall and Rise of World Trade

The ratio of world exports of manufactured goods to world industrial production—shown here as an index with 1953 = 1— rose in the decades before World War I but fell sharply in the face of wars and protectionism. It didn't return to 1913 levels until the 1970s but has since reached new heights.

Source: UN Monthly Bulletin of Statistics, World Trade Organization.

of international trade: the ratio of an index of world exports of manufactured goods to an index of world industrial production. World trade grew rapidly in the decades leading up to World War I but then fell significantly. As you can see, by this measure globalization didn't return to pre-World-War-I levels until the early 1970s.

Since then, however, world trade as a share of world production has risen to unprecedented heights. Much of this rise in the value of world trade reflects the so-called "vertical disintegration" of production: Before a product reaches the hands of consumers, it often goes through many production stages in different countries. For example, consumer electronic products—cell phones, iPods, and so on—are often assembled in low-wage nations such as China from components produced in higher-wage nations like Japan. Because of the extensive cross-shipping of components, a $100 product can give rise to $200 or $300 worth of international trade flows.

What Do We Trade?

When countries trade, what do they trade? For the world as a whole, the main answer is that they ship manufactured goods such as automobiles, computers, and clothing to each other. However, trade in mineral products—a category that includes everything from copper ore to coal, but whose main component in the modern world is oil—remains an important part of world trade. Agricultural products such as wheat, soybeans, and cotton are another key piece of the picture, and services of various kinds play an important role and are widely expected to become more important in the future.

Figure 2-6 shows the percentage breakdown of world exports in 2015. Manufactured goods of all kinds make up the lion's share of world trade. Most of the value of mining goods consists of oil and other fuels. Trade in agricultural products, although crucial in feeding many countries, accounts for only a small fraction of the value of modern world trade.

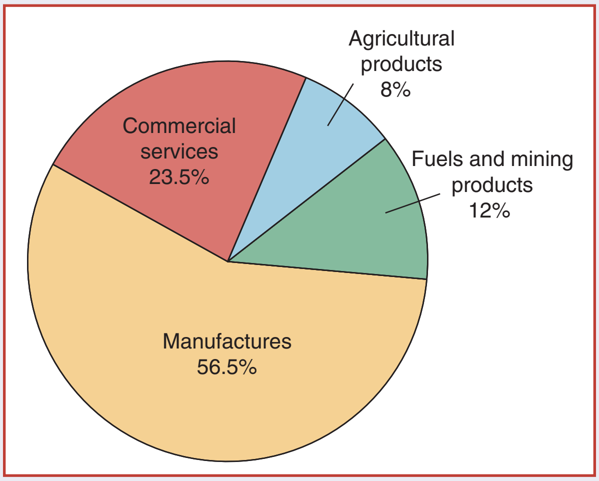
Meanwhile, service exports include traditional transportation fees charged by airlines and shipping companies, insurance fees received from foreigners, and spending by foreign tourists. In recent years, new types of service trade, made possible by modern telecommunications, have drawn a great deal of media attention.

FIGURE 2-6

The Composition of World Trade, 2015

Most world trade is in manufactured goods, but minerals—mainly oil—remain important.

Source: World Trade Organization.



The most famous example is the rise of overseas call and help centers: If you call an 800 number for information or technical help, the person on the other end of the line may well be in a remote country (the Indian city of Bangalore is a particularly popular location). So far, these exotic new forms of trade are still a relatively small part of the overall trade picture, but as explained below, that may change in the years ahead.

The current picture, in which manufactured goods dominate world trade, is relatively new. In the past, primary products—agricultural and mining goods—played a much more important role in world trade. Table 2-2 shows the share of manufactured goods in the exports and imports of the United Kingdom and the United States in 1910 and 2015. In the early 20th century, Britain, while it overwhelmingly exported manufactured goods (manufactures), mainly imported primary products. Today, manufactured goods dominate both sides of its trade. Meanwhile, the United States has gone from a trade pattern in which primary products were more important than manufactured goods on both sides to one in which manufactured goods dominate.

A more recent transformation has been the rise of third-world exports of manufactured goods. The terms **third world** and **developing countries** are applied to the world's poorer nations, many of which were European colonies before World War II. As recently as the 1970s, these countries mainly exported primary products. Since then, however, they have moved rapidly into exports of manufactured goods. Figure 2-7 shows the shares of agricultural products and manufactured goods in developing-country exports from 1960 to 2001. There has been an almost complete reversal of relative importance. For example, more than 90 percent of the exports of China, the largest developing economy and a rapidly growing force in world trade, consists of manufactured goods.

Service Offshoring

One of the hottest disputes in international economics right now is whether modern information technology, which makes it possible to perform some economic functions at long range, will lead to a dramatic increase in new forms of international trade. We've already mentioned the example of call centers, where the person answering your request for information may be 8,000 miles away. Many other services can also be done in a remote location. When a service previously done within a country is shifted to a foreign location, the change is known as **service offshoring** (sometimes known as **service outsourcing**). In addition, producers must decide whether they should set up a foreign subsidiary to provide those services (and operate as a multinational firm) or outsource those services to another firm. In Chapter 8, we describe in more detail how firms make these important decisions.

TABLE 2-2 Manufactured Goods as Percent of Merchandise Trade

	United Kingdom		United States	
	Exports	Imports	Exports	Imports
1910	75.4	24.5	47.5	40.7
2015	72.3	73.6	74.8	78.4

Source: 1910 data from Simon Kuznets, *Modern Economic Growth: Rate, Structure and Speed.* New Haven: Yale Univ. Press, 1966. 2015 data from World Trade Organization.

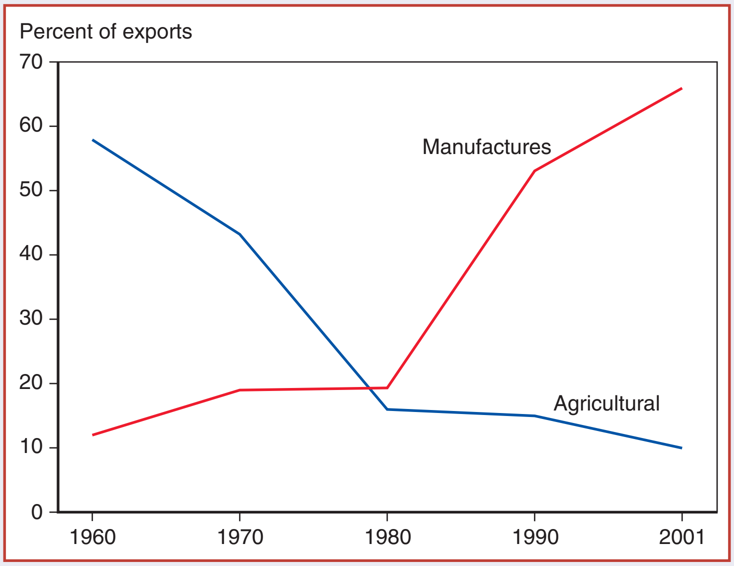


FIGURE 2-7

The Changing Composition of Developing-Country Exports

Over the past 50 years, the exports of developing countries have shifted toward manufactures.

Source: United Nations Council on Trade and Development.

In a famous *Foreign Affairs* article published in 2006, Alan Blinder, an economist at Princeton University, argued that

> "in the future, and to a great extent already in the present, the key distinction for international trade will no longer be between things that can be put in a box and things that cannot. It will, instead, be between services that can be delivered electronically over long distances with little or no degradation of quality, and those that cannot."

For example, the worker who restocks the shelves at your local grocery has to be on site, but the accountant who keeps the grocery's books could be in another country, keeping in touch over the Internet. The nurse who takes your pulse has to be nearby, but the radiologist who reads your X-ray could receive the images electronically anywhere that has a high-speed connection.

At this point, service outsourcing gets a great deal of attention precisely because it's still fairly rare. The question is how big it might become, and how many workers who currently face no international competition might see that change in the future. One way economists have tried to answer this question is by looking at which services are traded at long distances *within* the United States. For example, many financial services are provided to the nation from New York, the country's financial capital; much of the country's software publishing takes place in Seattle, home of Microsoft; much of America's (and the world's) Internet search services are provided from the Googleplex in Mountain View, California, and so on.

Figure 2-8 shows the results of one study that systematically used data on the location of industries within the United States to determine which services are and are not tradable

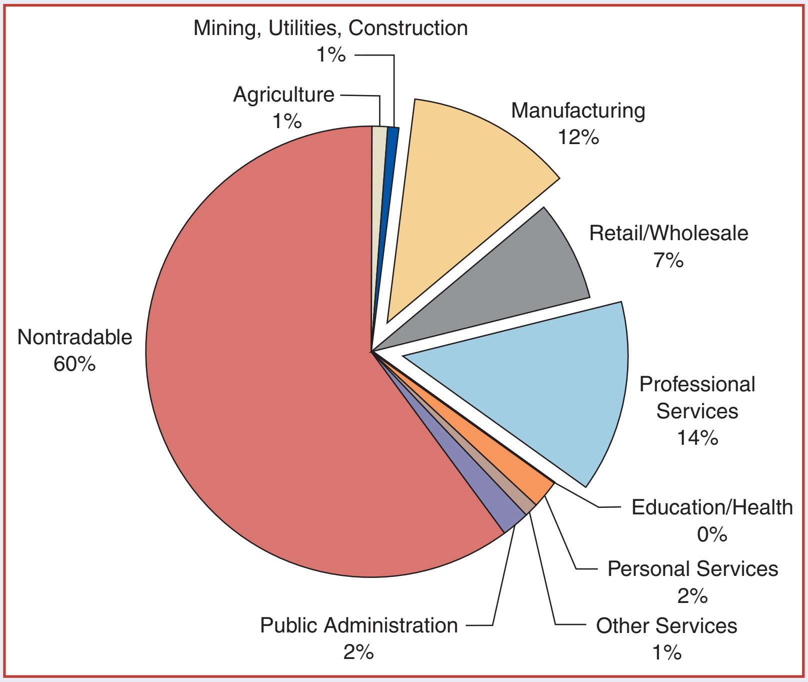


FIGURE 2-8

Tradable Industries' Share of Employment

Estimates based on trade within the United States suggest that trade in services may eventually become bigger than trade in manufactures.

Source: J. Bradford Jensen and Lori. G. Kletzer, "Tradable Services: Understanding the Scope and Impact of Services Outsourcing," Peterson Institute of Economics Working Paper 5–09, May 2005.

at long distances. As the figure shows, the study concluded that about 60 percent of total U.S. employment consists of jobs that must be done close to the customer, making them nontradable. But the 40 percent of employment that is in tradable activities includes more service than manufacturing jobs. This suggests that the current dominance of world trade by manufactures, shown in Figure 2-6, may be only temporary. In the long run, trade in services, delivered electronically, may become the most important component of world trade. We discuss the implication of these trends for U.S. employment in Chapter 8.

Do Old Rules Still Apply?

We begin our discussion of the causes of world trade in Chapter 3 with an analysis of a model originally put forth by the British economist David Ricardo in 1819. Given all the changes in world trade since Ricardo's time, can old ideas still be relevant? The answer is a resounding yes. Even though much about international trade has changed, the fundamental principles discovered by economists at the dawn of a global economy still apply.

It's true that world trade has become harder to characterize in simple terms. A century ago, each country's exports were obviously shaped in large part by its climate and natural resources. Tropical countries exported tropical products such as coffee and cotton; land-rich countries such as the United States and Australia exported food to densely populated European nations. Disputes over trade were also easy to explain: The classic political battles over free trade versus protectionism were waged between English landowners who wanted protection from cheap food imports and English manufacturers who exported much of their output.

The sources of modern trade are more subtle. Human resources and human-created resources (in the form of machinery and other types of capital) are more important than natural resources. Political battles over trade typically involve workers whose skills are made less valuable by imports—clothing workers who face competition from imported apparel and tech workers who now face competition from Bangalore.

As we'll see in later chapters, however, the underlying logic of international trade remains the same. Economic models developed long before the invention of jet planes or the Internet remain key to understanding the essentials of 21st-century international trade.

SUMMARY

1. The *gravity model* relates the trade between any two countries to the sizes of their economies. Using the gravity model also reveals the strong effects of distance and international borders—even friendly borders like that between the United States and Canada—in discouraging trade.
2. International trade is at record levels relative to the size of the world economy, thanks to falling costs of transportation and communications. However, trade has not grown in a straight line: The world was highly integrated in 1914, but trade was greatly reduced by economic depression, protectionism, and war, and took decades to recover.
3. Manufactured goods dominate modern trade today. In the past, however, primary products were much more important than they are now; recently, trade in services has become increasingly important.
4. *Developing countries*, in particular, have shifted from being mainly exporters of primary products to being mainly exporters of manufactured goods.

KEY TERMS

developing countries, p. 19
gravity model, p. 12
gross domestic product (GDP), p. 11
service offshoring (service outsourcing), p. 19
third world, p. 19
trade agreement, p. 15

PROBLEMS

MyEconLab

1. Canada and Australia are (mainly) English-speaking countries with populations that are not too different in size (Canada's is 60 percent larger). But Canadian trade is twice as large, relative to GDP, as Australia's. Why should this be the case?
2. Mexico and Brazil have very different trading patterns. While Mexico trades mainly with the United States, Brazil trades about equally with the United States and with the European Union. In addition, Mexico does much more trade relative to its GDP. Explain these differences using the gravity model.
3. Equation (2.1) says that trade between any two countries is proportional to the product of their GDPs. Does this mean that if the GDP of every country in the world doubled, world trade would quadruple?

4. Over the past few decades, East Asian economies have increased their share of world GDP. Similarly, intra–East Asian trade—that is, trade among East Asian nations—has grown as a share of world trade. More than that, East Asian countries do an increasing share of their trade with each other. Explain why, using the gravity model.
5. A century ago, most British imports came from relatively distant locations: North America, Latin America, and Asia. Today, most British imports come from other European countries. How does this fit in with the changing types of goods that make up world trade?

FURTHER READINGS

Paul Bairoch. *Economics and World History*. London: Harvester, 1993. A grand survey of the world economy over time.

Alan S. Blinder. "Offshoring: The Next Industrial Revolution?" *Foreign Affairs*, March/April 2006. An influential article by a well-known economist warning that the growth of trade in services may expose tens of millions of previously "safe" jobs to international competition. The article created a huge stir when it was published.

Frances Cairncross. *The Death of Distance*. London: Orion, 1997. A look at how technology has made the world smaller.

Keith Head. "Gravity for Beginners." A useful guide to the gravity model, available at http://pacific.commerce.ubc.ca/keith/gravity.pdf

Harold James. *The End of Globalization: Lessons from the Great Depression*. Cambridge: Harvard University Press, 2001. A survey of how the first great wave of globalization ended.

J. Bradford Jensen and Lori G. Kletzer. "Tradable Services: Understanding the Scope and Impact of Services Outsourcing." Peterson Institute Working Paper 5–09, May 2005. A systematic look at which services are traded within the United States, with implications about the future of international trade in services.

World Bank. *World Development Report 1995*. Each year the World Bank spotlights an important global issue; the 1995 report focused on the effects of growing world trade.

World Trade Organization. *World Trade Report*. An annual report on the state of world trade. Each year's report has a theme; for example, the 2004 report focused on the effects on world trade of domestic policies such as spending on infrastructure.

CHAPTER 3

Labor Productivity and Comparative Advantage: The Ricardian Model

Countries engage in international trade for two basic reasons, each of which contributes to their gains from trade. First, countries trade because they are different from each other. Nations, like individuals, can benefit from their differences by reaching an arrangement in which each does the things it does relatively well. Second, countries trade to achieve economies of scale in production. That is, if each country produces only a limited range of goods, it can produce each of these goods at a larger scale and hence more efficiently than if it tried to produce everything. In the real world, patterns of international trade reflect the interaction of both these motives. As a first step toward understanding the causes and effects of trade, however, it is useful to look at simplified models in which only one of these motives is present.

The next four chapters develop tools to help us to understand how differences between countries give rise to trade between them and why this trade is mutually beneficial. The essential concept in this analysis is that of comparative advantage.

Although comparative advantage is a simple concept, experience shows that it is a surprisingly hard concept for many people to understand (or accept). Indeed, the late Paul Samuelson—the Nobel laureate economist who did much to develop the models of international trade discussed in Chapters 4 and 5—once described comparative advantage as the best example he knows of an economic principle that is undeniably true yet not obvious to intelligent people.

In this chapter, we begin with a general introduction to the concept of comparative advantage and then proceed to develop a specific model of how comparative advantage determines the pattern of international trade.

LEARNING GOALS

After reading this chapter, you will be able to:

- Explain how the *Ricardian model*, the most basic model of international trade, works and how it illustrates the principle of *comparative advantage*.

- Demonstrate *gains from trade* and refute common fallacies about international trade.
- Describe the empirical evidence that wages reflect productivity and that trade patterns reflect relative productivity.

The Concept of Comparative Advantage

On Valentine's Day, 1996, which happened to fall less than a week before the crucial February 20 primary in New Hampshire, Republican presidential candidate Patrick Buchanan stopped at a nursery to buy a dozen roses for his wife. He took the occasion to make a speech denouncing the growing imports of flowers into the United States, which he claimed were putting American flower growers out of business. And it is indeed true that a growing share of the market for winter roses in the United States is supplied by imports flown in from South American countries, Colombia in particular. But is that a bad thing?

The case of winter roses offers an excellent example of the reasons why international trade can be beneficial. Consider first how hard it is to supply American sweethearts with fresh roses in February. The flowers must be grown in heated greenhouses, at great expense in terms of energy, capital investment, and other scarce resources. Those resources could be used to produce other goods. Inevitably, there is a trade-off. In order to produce winter roses, the U.S. economy must produce fewer of other things, such as computers. Economists use the term **opportunity cost** to describe such trade-offs: The opportunity cost of roses in terms of computers is the number of computers that could have been produced with the resources used to produce a given number of roses.

Suppose, for example, that the United States currently grows 10 million roses for sale on Valentine's Day and that the resources used to grow those roses could have produced 100,000 computers instead. Then the opportunity cost of those 10 million roses is 100,000 computers. (Conversely, if the computers were produced instead, the opportunity cost of those 100,000 computers would be 10 million roses.)

Those 10 million Valentine's Day roses could instead have been grown in Colombia. It seems extremely likely that the opportunity cost of those roses in terms of computers would be less than it would be in the United States. For one thing, it is a lot easier to grow February roses in the Southern Hemisphere, where it is summer in February rather than winter. Furthermore, Colombian workers are less efficient than their U.S. counterparts at making sophisticated goods such as computers, which means that a given amount of resources used in computer production yields fewer computers in Colombia than in the United States. So the trade-off in Colombia might be something like 10 million winter roses for only 30,000 computers.

This difference in opportunity costs offers the possibility of a mutually beneficial rearrangement of world production. Let the United States stop growing winter roses and devote the resources this frees up to producing computers; meanwhile, let Colombia grow those roses instead, shifting the necessary resources out of its computer industry. The resulting changes in production would look like Table 3-1.

Look what has happened: The world is producing just as many roses as before, but it is now producing more computers. So this rearrangement of production, with the United States concentrating on computers and Colombia concentrating on roses, increases the size of the world's economic pie. Because the world as a whole is producing more, it is possible in principle to raise everyone's standard of living.

TABLE 3-1 Hypothetical Changes in Production

	Million Roses	Thousand Computers
United States	−10	+100
Colombia	+10	−30
Total	0	+70

The reason that international trade produces this increase in world output is that it allows each country to specialize in producing the good in which it has a comparative advantage. A country has a **comparative advantage** in producing a good if the opportunity cost of producing that good in terms of other goods is lower in that country than it is in other countries.

In this example, Colombia has a comparative advantage in winter roses and the United States has a comparative advantage in computers. The standard of living can be increased in both places if Colombia produces roses for the U.S. market, while the United States produces computers for the Colombian market. We therefore have an essential insight about comparative advantage and international trade: *Trade between two countries can benefit both countries if each country exports the goods in which it has a comparative advantage.*

This is a statement about possibilities—not about what will actually happen. In the real world, there is no central authority deciding which country should produce roses and which should produce computers. Nor is there anyone handing out roses and computers to consumers in both places. Instead, international production and trade are determined in the marketplace, where supply and demand rule. Is there any reason to suppose that the potential for mutual gains from trade will be realized? Will the United States and Colombia actually end up producing the goods in which each has a comparative advantage? Will the trade between them actually make both countries better off?

To answer these questions, we must be much more explicit in our analysis. In this chapter, we will develop a model of international trade originally proposed by British economist David Ricardo, who introduced the concept of comparative advantage in the early 19th century.[1] This approach, in which international trade is solely due to international differences in the productivity of labor, is known as the **Ricardian model.**

A One-Factor Economy

To introduce the role of comparative advantage in determining the pattern of international trade, we begin by imagining that we are dealing with an economy—which we call Home—that has only one factor of production. (In Chapter 4 we extend the analysis to models in which there are several factors.) We imagine that only two goods, wine and cheese, are produced. The technology of Home's economy can be summarized by labor productivity in each industry, expressed in terms of the **unit labor requirement,** the number of hours of labor required to produce a pound of cheese or a gallon of wine. For example, it might require one hour of labor to produce a pound of cheese and two hours to produce a gallon of wine. Notice, by the way, that we're defining unit labor requirements as the *inverse* of productivity—the more cheese or wine a worker

[1]The classic reference is David Ricardo, *The Principles of Political Economy and Taxation*, first published in 1817.