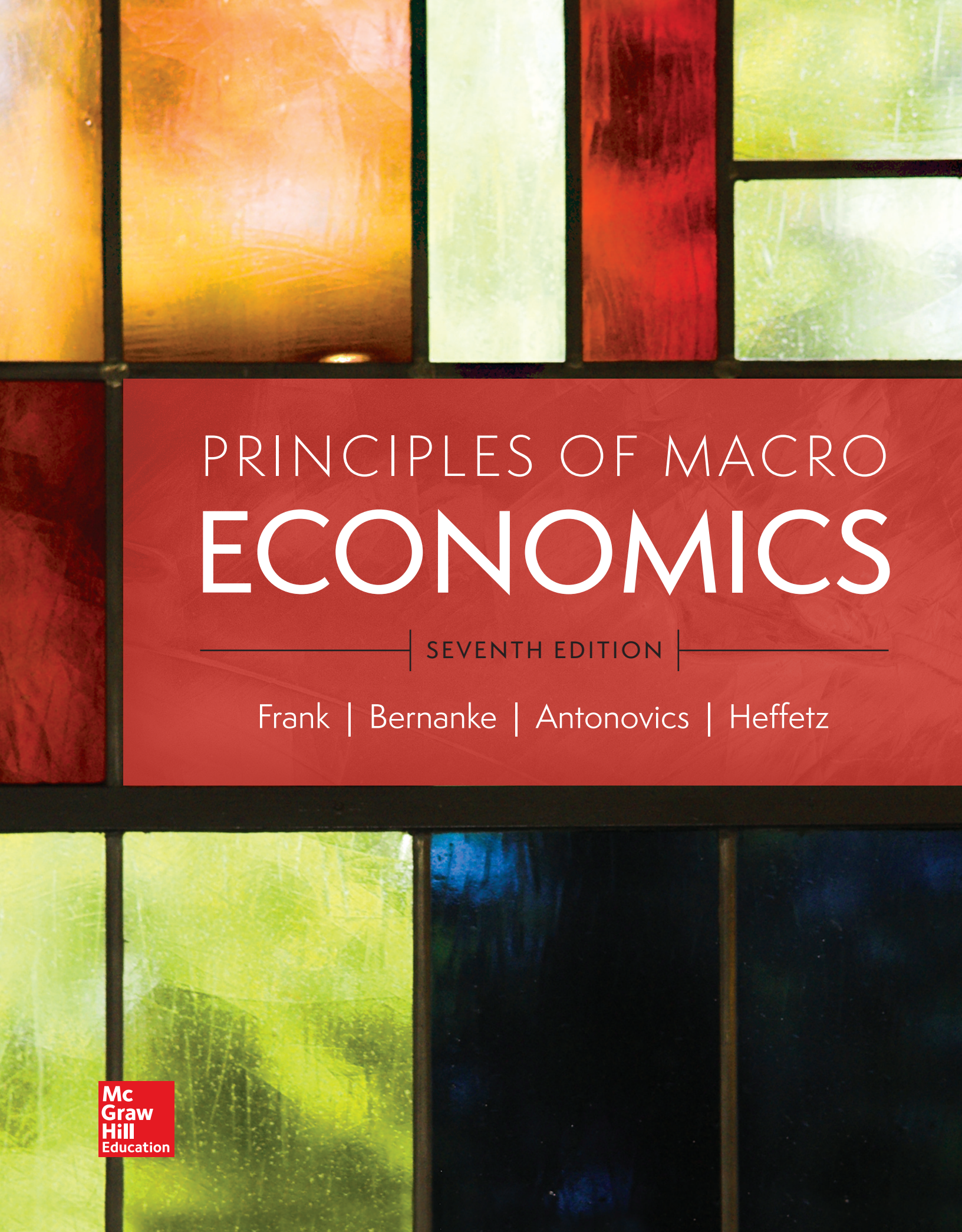
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PRINCIPLES OF
MACROECONOMICS

Seventh Edition

ROBERT H. FRANK

Cornell University

BEN S. BERNANKE

Brookings Institution [affiliated]
Former Chairman, Board of Governors of the Federal Reserve System

KATE ANTONOVICS

University of California, San Diego

ORI HEFFETZ

Cornell University and the Hebrew University of Jerusalem

Mc Graw Hill Education

PRINCIPLES OF MACROECONOMICS, SEVENTH EDITION
Published by McGraw-Hill Education, 2 Penn Plaza, New York, NY 10121.

This book is printed on acid-free paper.

1 2 3 4 5 6 7 8 9 0 LWI 21 20 19 18

ISBN 978-1-260-11100-2 (student edition)
MHID 1-260-11100-8 (student edition)

ISBN 978-1-260-11092-0 (loose leaf edition)
MHID 1-260-11092-3 (loose leaf edition)

Executive Portfolio Manager: *Katie Hoenicke*
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DEDICATION

For Ellen

R. H. F.

For Anna

B. S. B.

For Fiona and Henry

K. A.

For Katrina, Eleanor, Daniel, and Amalia

O. H.

ABOUT THE AUTHORS

ROBERT H. FRANK

Robert H. Frank is the H. J. Louis Professor of Management and Professor of Economics at Cornell's Johnson School of Management, where he has taught since 1972. His "Economic View" column appears regularly in *The New York Times.* After receiving his B.S. from Georgia Tech in 1966, he taught math and science for two years as a Peace Corps Volunteer in rural Nepal. He received his M.A. in statistics in 1971 and his Ph.D. in economics in 1972 from The University of California at Berkeley. He also holds honorary doctorate degrees from the University of St. Gallen and Dalhousie University. During leaves of absence from Cornell, he has served as chief economist for the Civil Aeronautics Board (1978–1980), a Fellow at the Center for Advanced Study in the Behavioral Sciences (1992–1993), Professor of American Civilization at l'École des Hautes Études en Sciences Sociales in Paris (2000–2001), and the Peter and Charlotte Schoenfeld Visiting Faculty Fellow at the NYU Stern School of Business in 2008–2009. His papers have appeared in the *American Economic Review, Econometrica,* the *Journal of Political Economy,* and other leading professional journals.

Professor Frank is the author of a best-selling intermediate economics textbook—*Microeconomics and Behavior*, Ninth Edition (Irwin/McGraw-Hill, 2015). His research has focused on rivalry and cooperation in economic and social behavior. His books on these themes include *Choosing the Right Pond* (Oxford, 1995), *Passions Within Reason* (W. W. Norton, 1988), *What Price the Moral High Ground?* (Princeton, 2004), *Falling Behind* (University of California Press, 2007), *The Economic Naturalist* (Basic Books, 2007), *The Economic Naturalist's Field Guide* (Basic Books, 2009), *The Darwin Economy* (Princeton, 2011), and *Success and Luck* (Princeton, 2016), which have been translated into 24 languages. *The Winner-Take-All Society* (The Free Press, 1995), co-authored with Philip Cook, received a Critic's Choice Award, was named a Notable Book of the Year by *The New York Times*, and was included in *BusinessWeek*'s list of the 10 best books of 1995. *Luxury Fever* (The Free Press, 1999) was named to the *Knight-Ridder* Best Books list for 1999.

Professor Frank has been awarded an Andrew W. Mellon Professorship (1987–1990), a Kenan Enterprise Award (1993), and a Merrill Scholars Program Outstanding Educator Citation (1991). He is a co-recipient of the 2004 Leontief Prize for Advancing the Frontiers of Economic Thought. He was awarded the Johnson School's Stephen Russell Distinguished Teaching Award in 2004, 2010, and 2012, and the School's Apple Distinguished Teaching Award in 2005. His introductory microeconomics course has graduated more than 7,000 enthusiastic economic naturalists over the years.

BEN S. BERNANKE

Professor Bernanke received his B.A. in economics from Harvard University in 1975 and his Ph.D. in economics from MIT in 1979. He taught at the Stanford Graduate School of Business from 1979 to 1985 and moved to Princeton University in 1985, where he was named the Howard Harrison and Gabrielle Snyder Beck Professor of Economics and Public Affairs and where he served as Chairman of the Economics Department. Professor Bernanke is currently a Distinguished Fellow in Residence with the Economic Studies Program at the Brookings Institution.

Professor Bernanke was sworn in on February 1, 2006, as Chairman and a member of the Board of Governors of the Federal Reserve System—his second term expired January 31, 2014. Professor Bernanke also served as Chairman of the Federal Open Market Committee, the Fed's principal monetary policymaking body. Professor Bernanke was also Chairman of the President's Council of Economic Advisers from June 2005 to January 2006.

Professor Bernanke's intermediate textbook, with Andrew Abel and Dean Croushore, *Macroeconomics,* Ninth Edition (Addison-Wesley, 2017), is a best seller in its field. He has authored numerous scholarly publications in macroeconomics, macroeconomic history, and finance. He has done significant research on the causes of the Great Depression, the role of financial markets and institutions in the business cycle, and measurement of the effects of monetary policy on the economy.

Professor Bernanke has held a Guggenheim Fellowship and a Sloan Fellowship, and he is a Fellow of the Econometric Society and of the American Academy of Arts and Sciences. He served as the Director of the Monetary Economics Program of the National Bureau of Economic Research (NBER) and as a member of the NBER's Business Cycle Dating Committee. From 2001–2004, he served as editor of the *American Economic Review*. Professor Bernanke's work with civic and professional groups includes having served two terms as a member of the Montgomery Township (N.J.) Board of Education. Visit Professor Bernanke's blog at www.brookings.edu/blogs/ben-bernanke.

KATE ANTONOVICS

Professor Antonovics received her B.A. from Brown University in 1993 and her Ph.D. in economics from the University of Wisconsin in 2000. Shortly thereafter, she joined the faculty in the Economics Department at the University of California, San Diego (UCSD), where she has been ever since.

Professor Antonovics is known for her excellence in teaching and her innovative use of technology in the classroom. Her popular introductory-level microeconomics course regularly enrolls more than 900 students each fall. She also teaches labor economics at both the undergraduate and graduate level. She has received numerous teaching awards, including the UCSD Department of Economics award for Best Undergraduate Teaching, the UCSD Academic Senate Distinguished Teaching Award, and the UCSD Chancellor's Associates Faculty Excellence Award in Undergraduate Teaching.

Professor Antonovics's research has focused on racial discrimination, gender discrimination, affirmative action, intergenerational income mobility, learning, and wage dynamics. Her papers have appeared in the *American Economic Review,* the *Review of Economics and Statistics,* the *Journal of Labor Economics,* and the *Journal of Human Resources*. She is a member of both the American Economic Association and the Society of Labor Economists.

ORI HEFFETZ

Professor Heffetz received his B.A. in physics and philosophy from Tel Aviv University in 1999 and his Ph.D. in economics from Princeton University in 2005. He is an Associate Professor of Economics at the Samuel Curtis Johnson Graduate School of Management at Cornell University, and at the Economics Department at the Hebrew University of Jerusalem.

Bringing the real world into the classroom, Professor Heffetz has created a unique macroeconomics course that introduces basic concepts and tools from economic theory and applies them to current news and global events. His popular classes are taken by hundreds of students every year on Cornell's Ithaca and New York city campuses and via live videoconferencing in dozens of cities across the United States, Canada, and Latin America.

Professor Heffetz's research studies the social and cultural aspects of economic behavior, focusing on the mechanisms that drive consumers' choices and on the links among economic choices, individual well-being, and policymaking. He has published scholarly work on household consumption patterns, individual economic decision making, and survey methodology and measurement. He was a visiting researcher at the Bank of Israel during 2011, is currently a Research Associate at the National Bureau of Economic Research (NBER), and serves on the editorial board of *Social Choice and Welfare*.

PREFACE

Although many millions of dollars are spent each year on introductory economics instruction in American colleges and universities, the return on this investment has been disturbingly low. Studies have shown, for example, that several months after having taken a principles of economics course, former students are no better able to answer simple economics questions than others who never even took the course. Most students, it seems, leave our introductory courses without having learned even the most important basic economic principles.

The problem, in our view, is that these courses almost always try to teach students far too much. In the process, really important ideas get little more coverage than minor ones, and everything ends up going by in a blur. The human brain tends to ignore new information unless it comes up repeatedly. That's hardly surprising since only a tiny fraction of the terabytes of information that bombard us each day is likely to be relevant for anything we care about. Only when something comes up a third or fourth time does the brain start laying down new circuits for dealing with it.

Yet when planning their lectures, many instructors ask themselves, "How much can I cover today?" And because modern electronic media enable them to click through upwards of 100 PowerPoint slides in an hour, they feel they better serve their students when they put more information before them. But that's not the way learning works. Professors should instead be asking, "How much can my students absorb?"

Our approach to this text was inspired by our conviction that students will learn far more if we attempt to cover much less. Our basic premise is that a small number of basic principles do most of the heavy lifting in economics, and that if we focus narrowly and repeatedly on those principles, students can actually master them in just a single semester.

The enthusiastic reactions of users of previous editions of our textbook affirm the validity of this premise. Avoiding excessive reliance on formal mathematical derivations, we present concepts intuitively through examples drawn from familiar contexts. We rely throughout on a well-articulated list of seven Core Principles, which we reinforce repeatedly by illustrating and applying each principle in numerous contexts. We ask students periodically to apply these principles themselves to answer related questions, exercises, and problems.

Throughout this process, we encourage students to become "economic naturalists," people who employ basic economic principles to understand and explain what they observe in the world around them. An economic naturalist understands, for example, that infant safety seats are

required in cars but not in airplanes because the marginal cost of space to accommodate these seats is typically zero in cars but often hundreds of dollars in airplanes. Scores of such examples are sprinkled throughout the book. Each one, we believe, poses a question that should make any curious person eager to learn the answer. These examples stimulate interest while teaching students to see each feature of their economic landscape as the reflection of one or more of the Core Principles. Students talk about these examples with their friends and families. Learning economics is like learning a language. In each case, there is no substitution for actually speaking. By inducing students to speak economics, the Economic Naturalist examples serve this purpose.

For those who would like to learn more about the role of examples in learning economics, Bob Frank's lecture on this topic is posted on YouTube's "Authors@Google" series (https://www.youtube.com/watch?v=QaINVxelKEE, or search "Authors@Google Robert Frank").

KEY THEMES AND FEATURES

Emphasis on Seven Core Principles

As noted, a few Core Principles do most of the work in economics. By focusing almost exclusively on these principles, the text ensures that students leave the course with a deep mastery of them. In contrast, traditional encyclopedic texts so overwhelm students with detail that they often leave the course with little useful working knowledge at all.

- **The Scarcity Principle:** Although we have boundless needs and wants, the resources available to us are limited. So having more of one good thing usually means having less of another.
- **The Cost-Benefit Principle:** An individual (or a firm or a society) should take an action if, and only if, the extra benefits from taking the action are at least as great as the extra costs.
- **The Incentive Principle:** A person (or a firm or a society) is more likely to take an action if its benefit rises, and less likely to take it if its cost rises. In short, incentives matter.
- **The Principle of Comparative Advantage:** Everyone does best when each concentrates on the activity for which his or her opportunity cost is lowest.
- **The Principle of Increasing Opportunity Cost:** In expanding the production of any good, first employ those resources with the lowest opportunity cost, and only afterward turn to resources with higher opportunity costs.
- **The Efficiency Principle:** Efficiency is an important social goal because when the economic pie grows larger, everyone can have a larger slice.
- **The Equilibrium Principle:** A market in equilibrium leaves no unexploited opportunities for individuals but may not exploit all gains achievable through collective action.

Economic Naturalism

Our ultimate goal is to produce economic naturalists—people who see each human action as the result of an implicit or explicit cost-benefit calculation. The economic naturalist sees mundane details of ordinary existence in a new light and becomes actively engaged in the attempt to understand them. Some representative examples:

- Why has investment in computers increased so much in recent decades?
- Why does news of inflation hurt the stock market?
- Why do almost all countries provide free public education?

Economic Naturalist Video Series: We are very excited to offer for the first time an entire video series based on Economic Naturalist examples. A series of videos covering some of our favorite micro- and macro-focused examples can be used as part of classroom presentations or assigned for homework within McGraw-Hill Connect®. These fascinating, fun, and thought-provoking applications of economics in everyday life encourage students to think like an economist.

Active Learning Stressed

The only way to learn to hit an overhead smash in tennis is through repeated practice. The same is true for learning economics. Accordingly, we consistently introduce new ideas in the context of simple examples and then follow them with applications showing how they work in familiar settings. At frequent intervals, we pose concept checks that both test and reinforce the understanding of these ideas. The end-of-chapter questions and problems are carefully crafted to help students internalize and extend basic concepts and are available within Connect as assignable content so that instructors can require students to engage with this material. Experience with earlier editions confirms that this approach really does prepare students to apply basic economic principles to solve economic puzzles drawn from the real world.

Learning Glass Lecture Videos: A series of three- to five-minute lecture videos featuring the authors and utilizing learning glass technology provide students with an overview of important concepts. These videos, with accompanying questions, can be assigned within Connect or used as part of classroom discussion.

Modern Macroeconomics

- One of the biggest hurdles to the fruitful application of cost-benefit thinking is to recognize and measure the relevant costs and benefits. *Common decision pitfalls* identified by 2002 Nobel Laureate Daniel Kahneman and others—such as the tendency to ignore implicit costs, the tendency not to ignore sunk costs, and the tendency to confuse average and marginal costs and benefits—are introduced in Chapter 1, *Thinking Like an Economist,* and discussed repeatedly in subsequent chapters.

The Great Recession has renewed interest in cyclical fluctuations without challenging the importance of such long-run issues as growth, productivity, the evolution of real wages, and capital formation. Our treatment of these issues is organized as follows:

- A five-chapter treatment of *long-run issues*, followed by a modern treatment of *short-term fluctuations and stabilization policy,* emphasizes the important distinction between short- and long-run behavior of the economy.
- *Designed to allow for flexible treatment of topics,* these chapters are written so that short-run material (Chapters 12–15) can be used before long-run material (Chapters 7–11) with no loss of continuity.
- The analysis of aggregate demand and aggregate supply relates output to inflation, rather than to the price level, sidestepping the necessity of a separate derivation of the link between the output gap and inflation.
- This book places a heavy emphasis on *globalization,* starting with an analysis of its effects on real wage inequality and progressing to such issues as the costs and benefits of trade, the causes and effects of protectionism, the role of capital flows in domestic capital formation, the link between exchange rates and monetary policy, and the sources of speculative attacks on currencies.

ORGANIZATION OF THE SEVENTH EDITION

- **Outsourcing discussion supports comparative advantage material:** In Chapter 2, students will see a full-spectrum view of production possibilities and the realities economies face considering outsourcing decisions.
- **A preview of key macroeconomic material:** Chapter 4 is new to this edition and serves to provide an overview of core macroeconomic concepts that are to be discussed in further detail.
- **Flexible presentation:** Part 2, "Macroeconomics: Issues and Data," (Chapters 4–6) is a self-contained group of chapters that cover definition and measurement issues. This allows instructors to proceed to a discussion of either long-run concepts as discussed in Part 3 (Chapters 7–11) or short-run concepts as covered in Part 4 (Chapters 12–15) with no loss of continuity.
- **Thorough discussion of labor markets:** Trends in employment, wages, and unemployment are covered together in Chapter 8 to help students understand and distinguish between long-term trends and short-term fluctuations in the labor market.
- **Strong connection drawn between financial markets and money:** Chapter 11 brings together information on financial intermediaries, bond and stock markets, and international capital markets so that students can make the connections among stock markets, bond markets, international capital flows.
- **The simple Keynesian model:** We present the simple Keynesian model through examples that are developed both graphically and numerically.
- **Modular presentation of money and monetary policy:** Chapter 10 introduces students to the concept of money, which can be covered separately or in direct conjunction with the discussion of monetary policy in Chapter 14.
- **The presentation of aggregate demand and aggregate supply:** Chapter 15 has been completely rewritten. The *AD-AS* model is developed systematically (based on concepts introduced in Chapters 12–14) using a graphical approach, allowing students to better understand the link among economic theory, real-world macroeconomic behavior, and macroeconomic policymaking.
- **Flexible coverage of international economics:** Chapter 16 builds upon the comparative advantage material introduced in Chapter 2 as a basis of trade. Chapter 17 is a self-contained discussion of exchange rates that can be used whenever an instructor thinks it best to introduce this important subject.

CHANGES IN THE SEVENTH EDITION

Changes Common to All Chapters

In all chapters, the narrative has been tightened. Many of the examples have been updated, with a focus on examples that connect to current events such as the financial crisis of 2008 and the Great Recession of 2007–2009. The examples, concept checks, and end-of-chapter material from the previous edition have been redesigned to provide more clarity and ease of use. Several numbered examples in the macro portion of the book have been turned back into

Economic Naturalist examples as they were originally intended. Data have been updated throughout.

Chapter-by-Chapter Changes

- **Chapter 1:** Examples 1.5 and 1.6 have been updated to SpaceX scenarios.
- **Chapter 2:** An additional end-of-chapter problem has been added.
- **Chapter 3:** Minor adjustments made some of the end-of-chapter problems.
- **Chapter 4:** New to this edition, this chapter serves to provide a preview to the upcoming macroeconomic material that is to follow.
- **Chapter 5:** This was previously Chapter 11 (*Spending, Income, and Fiscal Policy*) with unemployment rate material from what was previously Chapter 6 (*Wages and Unemployment*) added here. In assessing the level of economic activity in a country, economists look at a variety of data, among those being real GDP and the unemployment rate. As such, this material was moved back up into this chapter as it had originally appeared. An extra Orchardia example has been added, along with women's labor force participation material. A discussion of circular flow diagrams has also been added.
- **Chapter 6:** This was previously Chapter 5. Figure 5.1 and Economic Naturalist 5.1 have been deleted. A new Economic Naturalist example explains why Congress periodically raises the minimum wage.
- **Chapter 7:** More analysis of the rise in the labor force participation rate and the share of the population with jobs has been incorporated. Example 7.4 has been changed to appear as Economic Naturalist 7.1. Similarly, Example 7.6 has been changed to appear as Economic Naturalist 7.2 and has been updated. "The Costs of Economic Growth" section was moved ahead of the "Promoting Economic Growth" section (LO4 and LO5 have thus been switched and rephrased). The "Are There Limits to Growth" subsection was promoted to a first-level head. Examples 7.8 and 7.9 were deleted entirely.
- **Chapter 8:** This was previously Chapter 6. Two labor market trends related to employment and unemployment have been added back into this chapter. The "Unemployment and the Unemployment Rate" section that appeared in this chapter previously has been moved to current Chapter 6. The "Impediments to Full Employment" section has been rewritten, and the subsections on minimum wage laws and unions have been deleted.
- **Chapter 9:** This was previously Chapter 8, with the bond and stock material now moved to Chapter 11. The "Why Do People Save" and "National Saving and Its Components" sections have been switched (LO2 and LO3 have thus been switched). A new Economic Naturalist example on why Chinese households save so much has been added. Examples 8.3 and 8.7 were changed to Economic Naturalist examples as they were originally intended. A new subsection, "Is Low Household Saving a Problem?" has been added to examine this question using both a microeconomic and macroeconomic perspective.
- **Chapter 10:** This was previously Chapter 9 with the financial intermediaries discussion now moved to Chapter 12. The Federal Reserve System discussion has been moved to appear in this chapter from what was previously Chapter 12. Example 12.1 has been changed to appear as Economic Naturalist 10.2. Example 9.2 was changed to Economic Naturalist 10.1 along with data updates to the Bitcoin material.
- **Chapter 11:** Combining material from previous Chapters 8, 9, and 15, this new chapter is entitled *Financial Markets and International Capital Flows*. We start with a discussion of the banking system and the allocation of saving from the previous Chapter 9. A new Economic Naturalist example has been added that discusses what happens to national economies during banking crises (the previous Japanese banking crisis example has been deleted). We then turn to the bond and stock material from the previous Chapter 8. A new Economic Naturalist example that examines the U.S. stock market is featured. We finish the chapter with a discussion of trade balance and international capital flows from the previous Chapter 15.
- **Chapter 12:** This was previously Chapter 10. A new Economic Naturalist example added to the introduction examines the effect of economic fluctuations on presidential elections and outcomes. A number of examples have been changed to Economic Naturalist examples. The Economic Naturalist example on Coca-Cola machines has been deleted.
- **Chapter 13:** This was previously Chapter 11. Example 11.1 was changed to Economic Naturalist 13.1 and has been revised to include Uber and Lyft. A number of examples throughout this chapter have been changed to Economic Naturalist examples with updates for currency.

- **Chapter 14:** Constructed from a rearranged version of previous Chapter 12, this chapter has been renamed *Stabilizing the Economy: The Role of the Fed*. We start with a discussion of the Federal Reserve and interest rates, which features new Examples 14.1 and 14.2 along with a new concept check. The section on how the Fed controls the money supply has been substantially revised. A new subsection answers the question, "Do interest rates always move together?"; it helps students understand what the Fed has been doing "unconventionally" since 2008. Material on the zero lower bound, quantitative easing, forward guidance, and interest on reserves and monetary-policy normalization has been added. Some of the narrative in "The Fed Fights a Recession" section has been drawn out as a numbered example. Example 12.4 has been changed to Economic Naturalist 14.2. Example 12.5 has been changed to Economic Naturalist 14.3. The section "Should the Federal Reserve Respond to Changes in Asset Prices" has been changed back to an Economic Naturalist example. A discussion of the Fed's policy reaction function and the Taylor rule has been added along with a discussion on excess reserves.

- **Chapter 15:** This chapter was previously Chapter 13 and has been rewritten. Now entitled *Aggregate Demand, Aggregate Supply, and Inflation,* we revert back to the way this material was presented in earlier editions.

- **Chapter 16:** Builds upon the comparative advantage as a basis for trade material introduced in Chapter 2. This chapter discusses production and consumption possibilities and the benefits of trade, a supply and demand perspective on trade, and protectionism. It also emphasizes that unless policymakers act to compensate those who lose from trade, the potential losers from trade may quite rationally be opposed to it.

- **Chapter 17:** This chapter was previously Chapter 15 with the international capital flows and balance of trade material moved to Chapter 11. The section on exchange rate determination in the long run has been moved toward the beginning of the chapter, with the real exchange rate material now appearing as part of the first section on exchange rates. We then move to a discussion of exchange rate determination in the short run, followed by monetary policy and the exchange rate. A new section on fixed exchange rates with material on speculative attacks and how monetary policy can be used to influence exchange rates has been added. A number of new Economic Naturalist examples have been added throughout.

ORGANIZED LEARNING IN THE SEVENTH EDITION

Chapter Learning Objectives

Students and professors can be confident that the organization of each chapter surrounds common themes outlined by four to seven learning objectives listed on the first page of each chapter. These objectives, along with AACSB and Bloom's Taxonomy Learning Categories, are connected to all test bank questions and end-of-chapter material to offer a comprehensive, thorough teaching and learning experience. Reports available within Connect allow instructors to easily output data related to student performance across chapter learning objectives, AACSB criteria, and Bloom's categories.

Assurance of Learning Ready

Many educational institutions today are focused on the notion of assurance of learning, an important element of some accreditation standards. *Principles of Macroeconomics,* 7/e, is designed specifically to support your assurance of learning initiatives with a simple, yet powerful, solution.

Instructors can use Connect to easily query for learning objectives that directly relate to the objectives of the course and then use the reporting features of Connect to aggregate student results in a similar fashion, making the collection and presentation of assurance of learning data simple and easy.

AACSB Statement

McGraw-Hill Education is a proud corporate member of AACSB International. Recognizing the importance and value of AACSB accreditation, the authors of *Principles of Macroeconomics,* 7/e, have sought to recognize the curricula guidelines detailed in AACSB standards for business accreditation by connecting questions in the test bank and end-of-chapter material to the general knowledge and skill guidelines found in AACSB standards. It is important to note that the statements contained in *Principles of Macroeconomics,* 7/e, are provided only as a guide for the users of this text.

A NOTE ON THE WRITING OF THIS EDITION

Ben Bernanke was sworn in on February 1, 2006, as Chairman and a member of the Board of Governors of the Federal Reserve System, a position to which he was reappointed in January 2010. From June 2005 until January 2006, he served as chairman of the President's Council of Economic Advisers. These positions have allowed him to play

an active role in making U.S. economic policy, but the rules of government service have restricted his ability to participate in the preparation of previous editions. Now that his second term as Chairman of the Federal Reserve is complete, we are happy to announce that Ben has been actively involved in the revision of the macro portion of the seventh edition.

ACKNOWLEDGMENTS

Our thanks first and foremost go to our brand manager, Katie Hoenicke, and our product developer, Christina Kouvelis. Katie encouraged us to think deeply about how to improve the book and helped us transform our ideas into concrete changes. Christina shepherded us through the revision process with intelligence, sound advice, and good humor. We are grateful as well to the production team, whose professionalism (and patience) was outstanding: Harvey Yep, content project manager; Bruce Gin, assessment project manager; Matt Diamond, lead designer; and all of those who worked on the production team to turn our manuscript into the text you see now. Finally, we also thank Bobby Pearson, marketing manager, for getting our message into the wider world.

Special thanks to Per Norander, University of North Carolina at Charlotte, for his energy, creativity, and help in refining the assessment material in Connect; Sukanya Kemp, University of Akron, for her detailed accuracy check of the learning glass and economic naturalist videos; Alvin Angeles and team at the University of California, San Diego, for their efforts in the production and editing of the learning glass videos; and Kevin Bertotti and the team at ITVK for their creativity in transforming Economic Naturalist examples into dynamic and engaging video vignettes.

Finally, our sincere thanks to the following teachers and colleagues, whose thorough reviews and thoughtful suggestions led to innumerable substantive improvements to *Principles of Macroeconomics, 7/e*.

Mark Abajian, *San Diego Mesa College*

Richard Agesa, *Marshall University*

Seemi Ahmad, *Dutchess Community College*

Jason Aimone, *Baylor University*

Chris Azevedo, *University of Central Missouri*

Narine Badasyan, *Murray State University*

Sigridur Benediktsdottir, *Yale University*

Brian C. Brush, *Marquette University*

Christopher Burkart, *University of West Florida*

Giuliana Campanelli Andreopoulos, *William Paterson University*

J. Lon Carlson, *Illinois State University*

Monica Cherry, *Saint John Fisher College*

Joni Charles, *Texas State University*

Anoshua Chaudhuri, *San Francisco State University*

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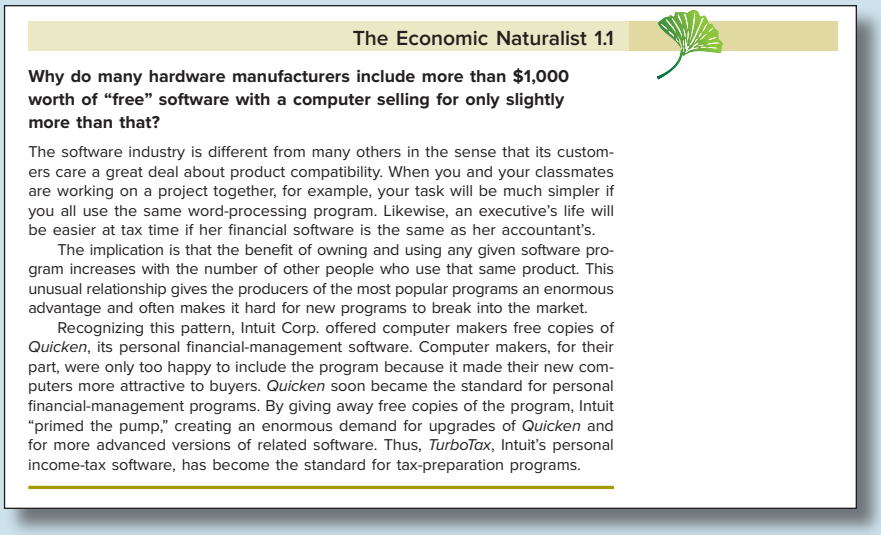
DISTINGUISHING FEATURES

ECONOMIC NATURALIST EXAMPLES

Each Economic Naturalist example starts with a question to spark interest in learning an answer. These examples fuel interest while teaching students to see economics in the world around them. Videos of select and new Economic Naturalist examples can be found within Connect. A full list of economic naturalist examples can be found following the table of contents.



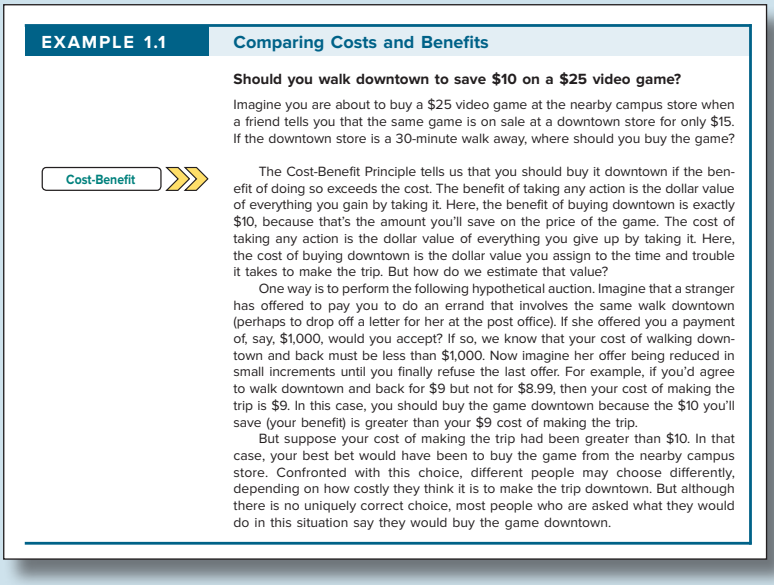
The Economic Naturalist 1.1

Why do many hardware manufacturers include more than $1,000 worth of "free" software with a computer selling for only slightly more than that?

The software industry is different from many others in the sense that its customers care a great deal about product compatibility. When you and your classmates are working on a project together, for example, your task will be much simpler if you all use the same word-processing program. Likewise, an executive's life will be easier at tax time if her financial software is the same as her accountant's.

The implication is that the benefit of owning and using any given software program increases with the number of other people who use that same product. This unusual relationship gives the producers of the most popular programs an enormous advantage and often makes it hard for new programs to break into the market.

Recognizing this pattern, Intuit Corp. offered computer makers free copies of *Quicken*, its personal financial-management software. Computer makers, for their part, were only too happy to include the program because it made their new computers more attractive to buyers. *Quicken* soon became the standard for personal financial-management programs. By giving away free copies of the program, Intuit "primed the pump," creating an enormous demand for upgrades of *Quicken* and for more advanced versions of related software. Thus, *TurboTax*, Intuit's personal income-tax software, has become the standard for tax-preparation programs.



EXAMPLE 1.1 **Comparing Costs and Benefits**

Should you walk downtown to save $10 on a $25 video game?

Imagine you are about to buy a $25 video game at the nearby campus store when a friend tells you that the same game is on sale at a downtown store for only $15. If the downtown store is a 30-minute walk away, where should you buy the game?

Cost-Benefit

The Cost-Benefit Principle tells us that you should buy it downtown if the benefit of doing so exceeds the cost. The benefit of taking any action is the dollar value of everything you gain by taking it. Here, the benefit of buying downtown is exactly $10, because that's the amount you'll save on the price of the game. The cost of taking any action is the dollar value of everything you give up by taking it. Here, the cost of buying downtown is the dollar value you assign to the time and trouble it takes to make the trip. But how do we estimate that value?

One way is to perform the following hypothetical auction. Imagine that a stranger has offered to pay you to do an errand that involves the same walk downtown (perhaps to drop off a letter for her at the post office). If she offered you a payment of, say, $1,000, would you accept? If so, we know that your cost of walking downtown and back must be less than $1,000. Now imagine her offer being reduced in small increments until you finally refuse the last offer. For example, if you'd agree to walk downtown and back for $9 but not for $8.99, then your cost of making the trip is $9. In this case, you should buy the game downtown because the $10 you'll save (your benefit) is greater than your $9 cost of making the trip.

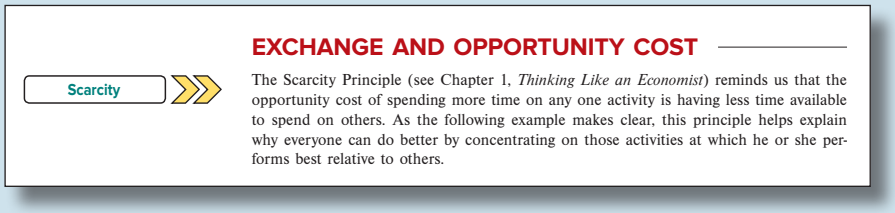
But suppose your cost of making the trip had been greater than $10. In that case, your best bet would have been to buy the game from the nearby campus store. Confronted with this choice, different people may choose differently, depending on how costly they think it is to make the trip downtown. But although there is no uniquely correct choice, most people who are asked what they would do in this situation say they would buy the game downtown.

NUMBERED EXAMPLES

Throughout the text, numbered and titled examples are referenced and called out to further illustrate concepts. Our engaging questions and examples from everyday life highlight how each human action is the result of an implicit or explicit cost-benefit calculation.

CORE PRINCIPLES

There are seven Core Principles that we focus on to ensure student mastery. Throughout the text, these principles are called out and are denoted by an icon in the margin. Again, the seven Core Principles are: scarcity, cost-benefit, incentive, comparative advantage, increasing opportunity cost, efficiency, and equilibrium.



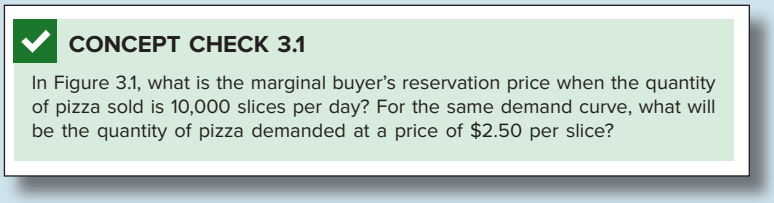
Scarcity

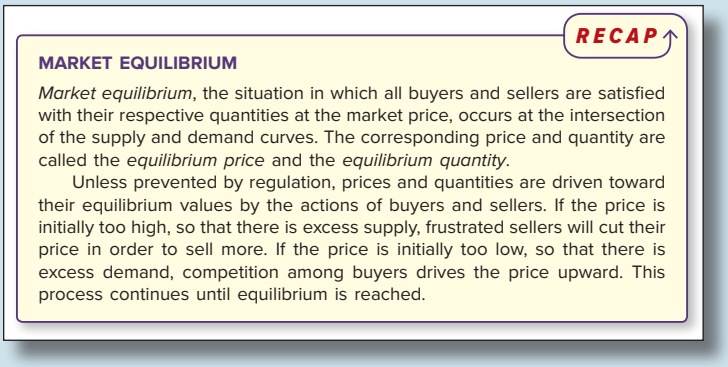
EXCHANGE AND OPPORTUNITY COST

The Scarcity Principle (see Chapter 1, *Thinking Like an Economist*) reminds us that the opportunity cost of spending more time on any one activity is having less time available to spend on others. As the following example makes clear, this principle helps explain why everyone can do better by concentrating on those activities at which he or she performs best relative to others.

CONCEPT CHECKS

These self-test questions in the body of the chapter enable students to determine whether the preceding material has been understood and reinforce understanding before reading further. Detailed answers to Concept Checks are found at the end of each chapter.





RECAP

Sprinkled throuhout each chapter are Recap boxes that underscore and summarize the importance of the preceding material and key concept takeaways.

SUPPLEMENTS

The following ancillaries are available for quick download and convenient access via the Instructor Resource material available through McGraw-Hill Connect®.

Solutions Manual

Prepared by the authors with assistance from Per Norander, University of North Carolina at Charlotte, this manual provides detailed answers to the end-of-chapter review questions and problems.

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The test bank has been carefully revised and reviewed for accuracy. Thousands of questions have been categorized by chapter learning objectives, AACSB learning categories, Bloom's Taxonomy objectives, and level of difficulty.

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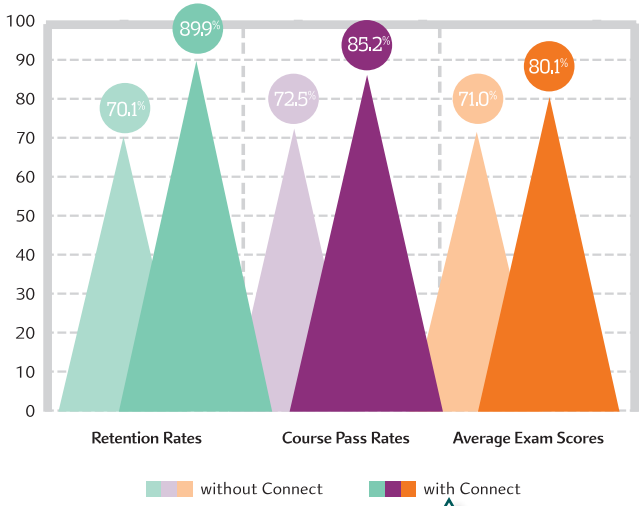

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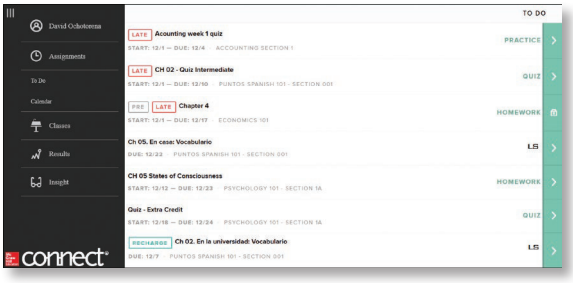

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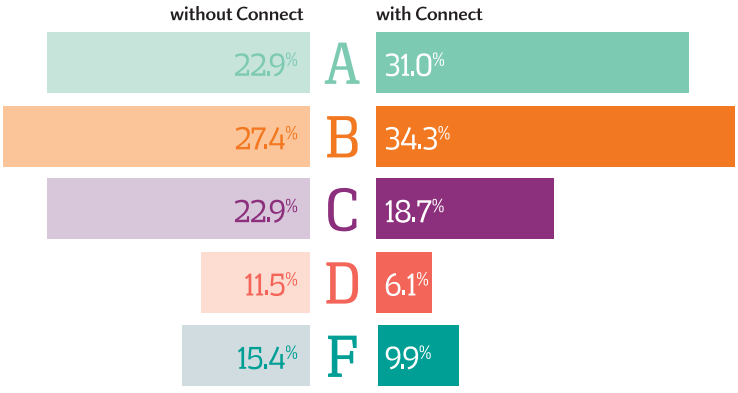

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BRIEF CONTENTS

CONTENTS

ECONOMIC NATURALIST EXAMPLES

PRINCIPLES OF
MACROECONOMICS

Seventh Edition

CHAPTER 1

Thinking Like an Economist

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People often make bad decisions because they fail to compare the relevant costs and benefits.

LEARNING OBJECTIVES

After reading this chapter, you should be able to:

LO1 Explain and apply the *Scarcity Principle*, which says that having more of any good thing necessarily requires having less of something else.

LO2 Explain and apply the *Cost-Benefit Principle*, which says that an action should be taken if, but only if, its benefit is at least as great as its cost.

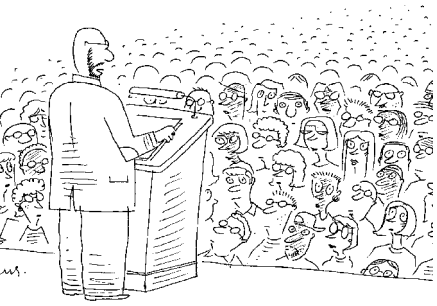
LO3 Discuss three important pitfalls that occur when applying the *Cost-Benefit Principle* inconsistently.

LO4 Explain and apply the *Incentive Principle*, which says that if you want to predict people's behavior, a good place to start is by examining their incentives.

How many students are in your introductory economics class? Some classes have just 20 or so. Others average 35, 100, or 200 students. At some schools, introductory economics classes may have as many as 2,000 students. What size is best?

If cost were no object, the best size might be a single student. Think about it: the whole course, all term long, with just you and your professor! Everything could be custom-tailored to your own background and ability. You could cover the material at just the right pace. The tutorial format also would promote close communication and personal trust between you and your professor. And your grade would depend more heavily on what you actually learned than on your luck when taking multiple-choice exams. Let's suppose, for the sake of discussion, that students have been shown to learn best in the tutorial format.

Why, then, do so many introductory classes still have hundreds of students? The simple reason is that costs *do* matter. They matter not just to the university administrators who must build classrooms and pay faculty salaries, but also to *you*. The direct cost of providing you with your own personal introductory economics course might easily top $50,000. *Someone* has to pay these costs. In private universities, a large share of the cost would be recovered directly from higher tuition payments. In state universities, the burden



Are small classes "better" than large ones?

would be split between higher tuition payments and higher tax payments. But, in either case, the course would be unaffordable for most students.

With larger classes, of course, the cost per student goes down. For example, an introductory economics course with 300 students might cost as little as $200 per student. But a class that large would surely compromise the quality of the learning environment. Compared to the custom tutorial format, however, it would be dramatically more affordable.

In choosing what size introductory economics course to offer, then, university administrators confront a classic economic trade-off. In making the class larger, they lower the quality of instruction—a bad thing. At the same time, they reduce costs and hence the tuition students must pay—a good thing.

In this chapter, we'll introduce three simple principles that will help you understand and explain patterns of behavior you observe in the world around you. These principles also will help you avoid three pitfalls that plague decision makers in everyday life.

ECONOMICS: STUDYING CHOICE IN A WORLD OF SCARCITY

Even in rich societies like the United States, *scarcity* is a fundamental fact of life. There is never enough time, money, or energy to do everything we want to do or have everything we'd like to have. **Economics** is the study of how people make choices under conditions of scarcity and of the results of those choices for society.

economics the study of how people make choices under conditions of scarcity and of the results of those choices for society

In the class-size example just discussed, a motivated economics student might definitely prefer to be in a class of 20 rather than a class of 100, everything else being equal. But other things, of course, are not equal. Students can enjoy the benefits of having smaller classes, but only at the price of having less money for other activities. The student's choice inevitably will come down to the relative importance of competing activities.

That such trade-offs are widespread and important is one of the core principles of economics. We call it the *Scarcity Principle* because the simple fact of scarcity makes trade-offs necessary. Another name for the scarcity principle is the *No-Free-Lunch Principle* (which comes from the observation that even lunches that are given to you are never really free—somebody, somehow, always has to pay for them).

Scarcity

The Scarcity Principle (also called the No-Free-Lunch Principle): Although we have boundless needs and wants, the resources available to us are limited. So having more of one good thing usually means having less of another.

Inherent in the idea of a trade-off is the fact that choice involves compromise between competing interests. Economists resolve such trade-offs by using cost-benefit analysis, which is based on the disarmingly simple principle that an action should be taken if, and only if, its benefits exceed its costs. We call this statement the *Cost-Benefit Principle,* and it, too, is one of the core principles of economics:

Cost-Benefit

The Cost-Benefit Principle: An individual (or a firm or a society) should take an action if, and only if, the extra benefits from taking the action are at least as great as the extra costs.

With the Cost-Benefit Principle in mind, let's think about our class-size question again. Imagine that classrooms come in only two sizes—100-seat lecture halls and 20-seat classrooms—and that your university currently offers introductory economics courses to classes of 100 students. Question: Should administrators reduce the class size to 20 students? Answer: Reduce if, and only if, the value of the improvement in instruction outweighs its additional cost.

This rule sounds simple. But to apply it we need some way to measure the relevant costs and benefits, a task that's often difficult in practice. If we make a few

simplifying assumptions, however, we can see how the analysis might work. On the cost side, the primary expense of reducing class size from 100 to 20 is that we'll now need five professors instead of just one. We'll also need five smaller classrooms rather than a single big one, and this too may add slightly to the expense of the move. Let's suppose that classes with 20 cost $1,000 per student more than those with 100. Should administrators switch to the smaller class size? If they apply the Cost-Benefit Principle, they will realize that *doing so makes sense only if the value of attending the smaller class is at least $1,000 per student greater than the value of attending the larger class.*

Would you (or your family) be willing to pay an extra $1,000 for a smaller class? If not, and if other students feel the same way, then sticking with the larger class size makes sense. But if you and others would be willing to pay the extra tuition, then reducing the class size makes good economic sense.

Notice that the "best" class size, from an economic point of view, will generally not be the same as the "best" size from the point of view of an educational psychologist. That's because the economic definition of "best" takes into account both the benefits *and* the costs of different class sizes. The psychologist ignores costs and looks only at the learning benefits of different class sizes.

In practice, of course, different people feel differently about the value of smaller classes. People with high incomes, for example, tend to be willing to pay more for the advantage. That helps to explain why average class size is smaller, and tuition higher, at private schools whose students come predominantly from high-income families.

The cost-benefit framework for thinking about the class-size problem also suggests a possible reason for the gradual increase in average class size that has been taking place in American colleges and universities. During the last 30 years, professors' salaries have risen sharply, making smaller classes more costly. During the same period, median family income—and hence the willingness to pay for smaller classes—has remained roughly constant. When the cost of offering smaller classes goes up but willingness to pay for smaller classes does not, universities shift to larger class sizes.

Scarcity and the trade-offs that result also apply to resources other than money. Mark Zuckerberg is one of the richest men on Earth. His wealth is estimated at more than $60 billion. That's more than the combined wealth of the poorest 40 percent of Americans. Zuckerberg could buy more houses, cars, vacations, and other consumer goods than he could possibly use. Yet he, like the rest of us, has only 24 hours each day and a limited amount of energy. So even he confronts trade-offs. Any activity he pursues—whether it be building his business empire or redecorating his mansion—uses up time and energy that he could otherwise spend on other things. Indeed, someone once calculated that the value of Zuckerberg's time is so great that pausing to pick up a $100 bill from the sidewalk simply wouldn't be worth his while.

©catwalker/Shutterstock

If Mark Zuckerberg saw a $100 bill lying on the sidewalk, would it be worth his time to pick it up?

APPLYING THE COST-BENEFIT PRINCIPLE

In studying choice under scarcity, we'll usually begin with the premise that people are **rational,** which means they have well-defined goals and try to fulfill them as best they can. The Cost-Benefit Principle is a fundamental tool for the study of how rational people make choices.

rational person someone with well-defined goals who tries to fulfill those goals as best he or she can

As in the class-size example, often the only real difficulty in applying the cost-benefit rule is to come up with reasonable measures of the relevant benefits and costs. Only in rare instances will exact dollar measures be conveniently available. But the cost-benefit framework can lend structure to your thinking even when no relevant market data are available.

To illustrate how we proceed in such cases, the following example asks you to decide whether to perform an action whose cost is described only in vague, qualitative terms.

EXAMPLE 1.1 Comparing Costs and Benefits

Should you walk downtown to save $10 on a $25 video game?

Imagine you are about to buy a $25 video game at the nearby campus store when a friend tells you that the same game is on sale at a downtown store for only $15. If the downtown store is a 30-minute walk away, where should you buy the game?

Cost-Benefit

The Cost-Benefit Principle tells us that you should buy it downtown if the benefit of doing so exceeds the cost. The benefit of taking any action is the dollar value of everything you gain by taking it. Here, the benefit of buying downtown is exactly $10, because that's the amount you'll save on the price of the game. The cost of taking any action is the dollar value of everything you give up by taking it. Here, the cost of buying downtown is the dollar value you assign to the time and trouble it takes to make the trip. But how do we estimate that value?

One way is to perform the following hypothetical auction. Imagine that a stranger has offered to pay you to do an errand that involves the same walk downtown (perhaps to drop off a letter for her at the post office). If she offered you a payment of, say, $1,000, would you accept? If so, we know that your cost of walking downtown and back must be less than $1,000. Now imagine her offer being reduced in small increments until you finally refuse the last offer. For example, if you'd agree to walk downtown and back for $9 but not for $8.99, then your cost of making the trip is $9. In this case, you should buy the game downtown because the $10 you'll save (your benefit) is greater than your $9 cost of making the trip.

But suppose your cost of making the trip had been greater than $10. In that case, your best bet would have been to buy the game from the nearby campus store. Confronted with this choice, different people may choose differently, depending on how costly they think it is to make the trip downtown. But although there is no uniquely correct choice, most people who are asked what they would do in this situation say they would buy the game downtown.

ECONOMIC SURPLUS

economic surplus the benefit of taking an action minus its cost

Cost-Benefit

Suppose that in Example 1.1 your "cost" of making the trip downtown was $9. Compared to the alternative of buying the game at the campus store, buying it downtown resulted in an **economic surplus** of $1, the difference between the benefit of making the trip and its cost. In general, your goal as an economic decision maker is to choose those actions that generate the largest possible economic surplus. This means taking all actions that yield a positive total economic surplus, which is just another way of restating the Cost-Benefit Principle.

Note that the fact that your best choice was to buy the game downtown doesn't imply that you *enjoy* making the trip, any more than choosing a large class means that you prefer large classes to small ones. It simply means that the trip is less unpleasant than the prospect of paying $10 extra for the game. Once again, you've faced a trade-off. In this case, the choice was between a cheaper game and the free time gained by avoiding the trip.

OPPORTUNITY COST

opportunity cost the value of what must be forgone to undertake an activity

Of course, your mental auction could have produced a different outcome. Suppose, for example, that the time required for the trip is the only time you have left to study for a difficult test the next day. Or suppose you are watching one of your favorite movies on cable, or that you are tired and would love a short nap. In such cases, we say that the **opportunity cost** of making the trip—that is, the value of what you must sacrifice to walk downtown and back—is high and you are more likely to decide against making the trip.

Strictly speaking, your opportunity cost of engaging in an activity is the value of everything you must sacrifice to engage in it. For instance, if seeing a movie requires not only that you buy a $10 ticket, but also that you give up a $20 babysitting job that you would have been willing to do for free, then the opportunity cost of seeing the film is $30.

Under this definition, *all* costs—both implicit and explicit—are opportunity costs. Unless otherwise stated, we will adhere to this strict definition.

We must warn you, however, that some economists use the term *opportunity cost* to refer only to the implicit value of opportunities forgone. Thus, in the example just discussed, these economists wouldn't include the $10 ticket price when calculating the opportunity cost of seeing the film. But virtually all economists would agree that your opportunity cost of not doing the babysitting job is $20.

In the previous example, if watching the last hour of the cable TV movie is the most valuable opportunity that conflicts with the trip downtown, the opportunity cost of making the trip is the dollar value you place on pursuing that opportunity. It is the largest amount you'd be willing to pay to avoid missing the end of the movie. Note that the opportunity cost of making the trip is not the combined value of *all* possible activities you could have pursued, but only the value of your *best* alternative—the one you would have chosen had you not made the trip.

Throughout the text we'll pose concept checks like the one that follows. You'll find that pausing to answer them will help you to master key concepts in economics. Because doing these concept checks isn't very costly (indeed, many students report that they're actually fun), the Cost-Benefit Principle indicates that it's well worth your while to do them.

CONCEPT CHECK 1.1

You would again save $10 by buying the game downtown rather than at the campus store, but your cost of making the trip is now $12, not $9. By how much would your economic surplus be smaller if you bought the game downtown rather than at the campus store?

THE ROLE OF ECONOMIC MODELS

Economists use the Cost-Benefit Principle as an abstract model of how an idealized rational individual would choose among competing alternatives. (By "abstract model" we mean a simplified description that captures the essential elements of a situation and allows us to analyze them in a logical way.) A computer model of a complex phenomenon like climate change, which must ignore many details and includes only the major forces at work, is an example of an abstract model.

Noneconomists are sometimes harshly critical of the economist's cost-benefit model on the grounds that people in the real world never conduct hypothetical mental auctions before deciding whether to make trips downtown. But this criticism betrays a fundamental misunderstanding of how abstract models can help to explain and predict human behavior. Economists know perfectly well that people don't conduct hypothetical mental auctions when they make simple decisions. All the Cost-Benefit Principle really says is that a rational decision is one that is explicitly or implicitly based on a weighing of costs and benefits.

Most of us make sensible decisions most of the time, without being consciously aware that we are weighing costs and benefits, just as most people ride a bike without being consciously aware of what keeps them from falling. Through trial and error, we gradually learn what kinds of choices tend to work best in different contexts, just as bicycle riders internalize the relevant laws of physics, usually without being conscious of them.

Even so, learning the explicit principles of cost-benefit analysis can help us make better decisions, just as knowing about physics can help in learning to ride a bicycle. For instance, when a young economist was teaching his oldest son to ride a bike, he followed

the time-honored tradition of running alongside the bike and holding onto his son, then giving him a push and hoping for the best. After several hours and painfully skinned elbows and knees, his son finally got it. A year later, someone pointed out that the trick to riding a bike is to turn slightly in whichever direction the bike is leaning. Of course! The economist passed this information along to his second son, who learned to ride almost instantly. Just as knowing a little physics can help you learn to ride a bike, knowing a little economics can help you make better decisions.

RECAP

COST-BENEFIT ANALYSIS

Scarcity is a basic fact of economic life. Because of it, having more of one good thing almost always means having less of another (the *scarcity principle*). The *Cost-Benefit Principle* holds that an individual (or a firm or a society) should take an action if, and only if, the extra benefit from taking the action is at least as great as the extra cost. The benefit of taking any action minus the cost of taking the action is called the *economic surplus* from that action. Hence, the Cost-Benefit Principle suggests that we take only those actions that create additional economic surplus.

THREE IMPORTANT DECISION PITFALLS[1]

Rational people will apply the Cost-Benefit Principle most of the time, although probably in an intuitive and approximate way, rather than through explicit and precise calculation. Knowing that rational people tend to compare costs and benefits enables economists to predict their likely behavior. As noted earlier, for example, we can predict that students from wealthy families are more likely than others to attend colleges that offer small classes. (Again, while the cost of small classes is the same for all families, their benefit, as measured by what people are willing to pay for them, tends to be higher for wealthier families.)

Yet researchers have identified situations in which people tend to apply the Cost-Benefit Principle inconsistently. In these situations, the Cost-Benefit Principle may not predict behavior accurately. But it proves helpful in another way, by identifying specific strategies for avoiding bad decisions.

PITFALL 1: MEASURING COSTS AND BENEFITS AS PROPORTIONS RATHER THAN ABSOLUTE DOLLAR AMOUNTS

As the next example makes clear, even people who seem to know they should weigh the pros and cons of the actions they are contemplating sometimes don't have a clear sense of how to measure the relevant costs and benefits.

EXAMPLE 1.2 Comparing Costs and Benefits

Should you walk downtown to save $10 on a $2,020 laptop computer?

You are about to buy a $2,020 laptop computer at the nearby campus store when a friend tells you that the same computer is on sale at a downtown store for only $2,010. If the downtown store is half an hour's walk away, where should you buy the computer?

[1]The examples in this section are inspired by the pioneering research of Daniel Kahneman and the late Amos Tversky. Kahneman was awarded the 2002 Nobel Prize in economics for his efforts to integrate insights from psychology into economics. You can read more about this work in Kahneman's brilliant 2011 book, *Thinking Fast and Slow* (New York: Macmillan).

Assuming that the laptop is light enough to carry without effort, the structure of this example is exactly the same as that of Example 1.1. The only difference is that the price of the laptop is dramatically higher than the price of the computer game. As before, the benefit of buying downtown is the dollar amount you'll save, namely, $10. And because it's exactly the same trip, its cost also must be the same as before. So if you are perfectly rational, you should make the same decision in both cases. Yet when people are asked what they would do in these situations, the overwhelming majority say they'd walk downtown to buy the game but would buy the laptop at the campus store. When asked to explain, most of them say something like, "The trip was worth it for the game because you save 40 percent, but not worth it for the laptop because you save only $10 out of $2,020."

This is faulty reasoning. The benefit of the trip downtown is not the *proportion* you save on the original price. Rather, it is the *absolute dollar amount* you save. The benefit of walking downtown to buy the laptop is $10, exactly the same as for the computer game. And because the cost of the trip must also be the same in both cases, the economic surplus from making both trips must be exactly the same. That means that a rational decision maker would make the same decision in both cases. Yet, as noted, most people choose differently.

The pattern of faulty reasoning in the decision just discussed is one of several decision pitfalls to which people are often prone. In the discussion that follows, we will identify two additional decision pitfalls. In some cases, people ignore costs or benefits that they ought to take into account. On other occasions they are influenced by costs or benefits that are irrelevant.

CONCEPT CHECK 1.2

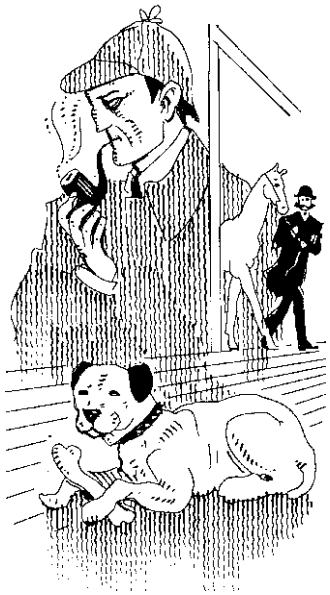
Which is more valuable: saving $100 on a $2,000 plane ticket to Tokyo or saving $90 on a $200 plane ticket to Chicago?

PITFALL 2: IGNORING IMPLICIT COSTS

Sherlock Holmes, Arthur Conan Doyle's legendary detective, was successful because he saw details that most others overlooked. In *Silver Blaze*, Holmes is called on to investigate the theft of an expensive racehorse from its stable. A Scotland Yard inspector assigned to the case asks Holmes whether some particular aspect of the crime requires further study. "Yes," Holmes replies, and describes "the curious incident of the dog in the nighttime." "The dog did nothing in the nighttime,"[2] responds the puzzled inspector. But, as Holmes realized, that was precisely the problem! The watchdog's failure to bark when Silver Blaze was stolen meant that the watchdog knew the thief. This clue ultimately proved the key to unraveling the mystery.

Just as we often don't notice when a dog fails to bark, many of us tend to overlook the implicit value of activities that fail to happen. As discussed earlier, however, intelligent decisions require taking the value of forgone opportunities properly into account.

The opportunity cost of an activity, once again, is the value of all that must be forgone in order to engage in that activity. If buying a computer game downtown means not watching the last hour of a movie, then the value to you of watching the end of that movie is an implicit cost of the trip. Many people make bad decisions because they tend to ignore the value of such forgone opportunities. To avoid overlooking implicit costs, economists often translate questions like "Should I walk downtown?" into ones like "Should I walk downtown or watch the end of the movie?"



Implicit costs are like dogs that fail to bark in the night.

[2]Source: Doyle, Arthur Conan, "The Adventure of Silver Blaze," *The Memoirs of Sherlock Holmes. London,* U.K.: George Newnes Ltd., 1893.

EXAMPLE 1.3 Implicit Cost

Should you use your frequent-flyer coupon to fly to Cancun for spring break?

With spring break only a week away, you are still undecided about whether to go to Cancun with a group of classmates at the University of Iowa. The round-trip airfare from Cedar Rapids is $500, but you have a frequent-flyer coupon you could use for the trip. All other relevant costs for the vacation week at the beach total exactly $1,000. The most you would be willing to pay for the Cancun vacation is $1,350. That amount is your benefit of taking the vacation. Your only alternative use for your frequent-flyer coupon is for a trip to Boston the weekend after spring break to attend your brother's wedding. (Your coupon expires shortly thereafter.) If the Cedar Rapids–Boston round-trip airfare is $400, should you use your frequent-flyer coupon to fly to Cancun for spring break?

Cost-Benefit

The Cost-Benefit Principle tells us that you should go to Cancun if the benefits of the trip exceed its costs. If not for the complication of the frequent-flyer coupon, solving this problem would be a straightforward matter of comparing your benefit from the week at the beach to the sum of all relevant costs. And because your airfare and other costs would add up to $1,500, or $150 more than your benefit from the trip, you would not go to Cancun.

But what about the possibility of using your frequent-flyer coupon to make the trip? Using it for that purpose might make the flight to Cancun seem free, suggesting you'd reap an economic surplus of $350 by making the trip. But doing so also would mean you'd have to fork over $400 for your airfare to Boston. So the implicit cost of using your coupon to go to Cancun is really $400. If you use it for that purpose, the trip still ends up being a loser because the cost of the vacation, $1,400, exceeds the benefit by $50. In cases like these, you're much more likely to decide sensibly if you ask yourself, "Should I use my frequent-flyer coupon for this trip or save it for an upcoming trip?"

Is your flight to Cancun "free" if you travel on a frequent-flyer coupon?

We cannot emphasize strongly enough that the key to using the Cost-Benefit Principle correctly lies in recognizing precisely what taking a given action prevents us from doing. Concept Check 1.3 illustrates this point by modifying the details of Example 1.3 slightly.

CONCEPT CHECK 1.3

Refer to given information in Example 1.3, but this time your frequent-flyer coupon expires in a week, so your only chance to use it will be for the Cancun trip. Should you use your coupon?

PITFALL 3: FAILURE TO THINK AT THE MARGIN

When deciding whether to take an action, the only relevant costs and benefits are those that would occur as a result of taking the action. Sometimes people are influenced by costs they ought to ignore. Other times they compare the wrong costs and benefits. *The only costs that should influence a decision about whether to take an action are those we can avoid by not taking the action. Similarly, the only benefits we should consider are those that would not occur unless the action were taken.* As a practical matter, however, many decision makers appear to be influenced by costs or benefits that would have occurred no matter what. Thus, people are often influenced by **sunk costs**—costs that are beyond recovery at the moment a decision is made. For example, money spent on a nontransferable, nonrefundable airline ticket is a sunk cost.

sunk cost a cost that is beyond recovery at the moment a decision must be made

As the following example illustrates, sunk costs must be borne *whether or not an action is taken,* so they are irrelevant to the decision of whether to take the action.

EXAMPLE 1.4 Sunk Cost

How much should you eat at an all-you-can-eat restaurant?

Sangam, an Indian restaurant in Philadelphia, offers an all-you-can-eat lunch buffet for $10. Customers pay $10 at the door, and no matter how many times they refill their plates, there is no additional charge. One day, as a goodwill gesture, the owner of the restaurant tells 20 randomly selected guests that their lunch is on the house. The remaining guests pay the usual price. If all diners are rational, will there be any difference in the average quantity of food consumed by people in these two groups?

Having eaten their first helping, diners in each group confront the following question: "Should I go back for another helping?" For rational diners, if the benefit of doing so exceeds the cost, the answer is yes; otherwise it is no. Note that at the moment of decision, the $10 charge for the lunch is a sunk cost. Those who paid it have no way to recover it. Thus, for both groups, the (extra) cost of another helping is exactly zero. And because the people who received the free lunch were chosen at random, there's no reason their appetites or incomes should be any different from those of other diners. The benefit of another helping thus should be the same, on average, for people in both groups. And because their respective costs and benefits are the same, the two groups should eat the same number of helpings, on average.

Psychologists and economists have experimental evidence, however, that people in such groups do *not* eat similar amounts.[3] In particular, those for whom the luncheon charge is not waived tend to eat substantially more than those for whom the charge is waived. People in the former group seem somehow determined to "get their money's worth." Their implicit goal is apparently to minimize the average cost per bite of the food they eat. Yet minimizing average cost is not a particularly sensible objective. It brings to mind the man who drove his car on the highway at night, even though he had nowhere to go, because he wanted to boost his average fuel economy. The irony is that diners who are determined to get their money's worth usually end up eating too much.

The fact that the cost-benefit criterion failed the test of prediction in Example 1.4 does nothing to invalidate its advice about what people *should* do. If you are letting sunk costs influence your decisions, you can do better by changing your behavior.

In addition to paying attention to costs and benefits that should be ignored, people often use incorrect measures of the relevant costs and benefits. This error often occurs when we must choose the *extent* to which an activity should be pursued (as opposed to choosing whether to pursue it at all). We can apply the Cost-Benefit Principle in such situations by repeatedly asking the question, "Should I increase the level at which I am currently pursuing the activity?"

In attempting to answer this question, the focus should always be on the benefit and cost of an *additional* unit of activity. To emphasize this focus, economists refer to the cost of an additional unit of activity as its **marginal cost.** Similarly, the benefit of an additional unit of the activity is its **marginal benefit.**

marginal cost the increase in total cost that results from carrying out one additional unit of an activity

marginal benefit the increase in total benefit that results from carrying out one additional unit of an activity

[3]See, for example, Richard Thaler, "Toward a Positive Theory of Consumer Choice," *Journal of Economic Behavior and Organization* 1, no. 1 (1980).

When the problem is to discover the proper level for an activity, the cost-benefit rule is to keep increasing the level as long as the marginal benefit of the activity exceeds its marginal cost. As the following example illustrates, however, people often fail to apply this rule correctly.

EXAMPLE 1.5 Focusing on Marginal Costs and Benefits

Should SpaceX expand its launch program from four launches per year to five?

SpaceX accountants have estimated that the gains from the company's new jumbo rocket launch program are currently $24 billion a year (an average of $6 billion per launch) and that its costs are currently $20 billion a year (an average $5 billion per launch). On the basis of these estimates, they have recommended that the company should increase its number of launches. Should SpaceX CEO Elon Musk follow their advice?

average cost the total cost of undertaking *n* units of an activity divided by *n*

average benefit the total benefit of undertaking *n* units of an activity divided by *n*

To discover whether the advice makes economic sense, we must compare the marginal cost of a launch to its marginal benefit. The accountants' estimates, however, tell us only the **average cost** and **average benefit** of the program. These are, respectively, the total cost of the program divided by the number of launches and the total benefit divided by the number of launches.

Knowing the average benefit and average cost per launch for all rockets launched thus far is simply not useful for deciding whether to expand the program. Of course, the average cost of the launches undertaken so far *might* be the same as the cost of adding another launch. But it also might be either higher or lower than the marginal cost of a launch. The same holds true regarding average and marginal benefits.

Suppose, for the sake of discussion, that the benefit of an additional launch is in fact the same as the average benefit per launch thus far, $6 billion. Should SpaceX add another launch? Not if the cost of adding the fifth launch would be more than $6 billion. And the fact that the average cost per launch is only $5 billion simply does not tell us anything about the marginal cost of the fifth launch.

Suppose, for example, that the relationship between the number of rockets launched and the total cost of the program is as described in Table 1.1. The average cost per launch (third column) when there are four launches would then be $20 billion/4 = $5 billion per launch, just as the accountants reported. But note in the second column of the table that adding a fifth launch would raise costs from $20 billion to $32 billion, making the marginal cost of the fifth launch $12 billion. So if the benefit of an additional launch is $6 billion, increasing the number of launches from four to five would make absolutely no economic sense.

TABLE 1.1
How Total Cost Varies with the Number of Launches

Number of launches	Total cost ($ billions)	Average cost ($ billion/launch)
0	0	0
1	3	3
2	7	3.5
3	12	4
4	20	5
5	32	6.4

The following example illustrates how to apply the *Cost-Benefit Principle* correctly in this case.

EXAMPLE 1.6 Focusing on Marginal Costs and Benefits

How many rockets should SpaceX launch?

SpaceX must decide how many rockets to launch. The benefit of each launch is estimated to be $6 billion, and the total cost of the program again depends on the number of launches as shown in Table 1.1. How many rockets should SpaceX launch?

SpaceX should continue to launch its jumbo rockets as long as the marginal benefit of the program exceeds its marginal cost. In this example, the marginal benefit is constant at $6 billion per launch, regardless of the number of shuttles launched. SpaceX should thus keep launching shuttles as long as the marginal cost per launch is less than or equal to $6 billion.

Applying the definition of marginal cost to the total cost entries in the second column of Table 1.1 yields the marginal cost values in the third column of Table 1.2. (Because marginal cost is the change in total cost that results when we change the number of launches by one, we place each marginal cost entry midway between the rows showing the corresponding total cost entries.) Thus, for example, the marginal cost of increasing the number of launches from one to two is $4 billion, the difference between the $7 billion total cost of two launches and the $3 billion total cost of one launch.

TABLE 1.2
How Marginal Cost Varies with the Number of Launches

Number of launches	Total cost ($ billions)	Marginal cost ($ billion/launch)
0	0	
		3
1	3	
		4
2	7	
		5
3	12	
		8
4	20	
		12
5	32	

As we see from a comparison of the $6 billion marginal benefit per launch with the marginal cost entries in the third column of Table 1.2, the first three launches satisfy the cost-benefit test, but the fourth and fifth launches do not. SpaceX should thus launch three rockets.

CONCEPT CHECK 1.4

If the marginal benefit of each launch had been not $6 billion but $9 billion, how many rockets should SpaceX have launched?

The cost-benefit framework emphasizes that the only relevant costs and benefits in deciding whether to pursue an activity further are *marginal* costs and benefits—measures that correspond to the *increment* of activity under consideration. In many contexts, however,

people seem more inclined to compare the *average* cost and benefit of the activity. As Example 1.5 made clear, increasing the level of an activity may not be justified, even though its average benefit at the current level is significantly greater than its average cost.

CONCEPT CHECK 1.5

Should a basketball team's best player take all the team's shots?

A professional basketball team has a new assistant coach. The assistant notices that one player scores on a higher percentage of his shots than other players. Based on this information, the assistant suggests to the head coach that the star player should take *all* the shots. That way, the assistant reasons, the team will score more points and win more games.

On hearing this suggestion, the head coach fires his assistant for incompetence. What was wrong with the assistant's idea?

RECAP

THREE IMPORTANT DECISION PITFALLS

1. **The pitfall of measuring costs or benefits proportionally.** Many decision makers treat a change in cost or benefit as insignificant if it constitutes only a small proportion of the original amount. Absolute dollar amounts, not proportions, should be employed to measure costs and benefits.
2. **The pitfall of ignoring implicit costs.** When performing a cost-benefit analysis of an action, it is important to account for all relevant costs, including the implicit value of alternatives that must be forgone in order to carry out the action. A resource (such as a frequent-flyer coupon) may have a high implicit cost, even if you originally got it "for free," if its best alternative use has high value. The identical resource may have a low implicit cost, however, if it has no good alternative uses.
3. **The pitfall of failing to think at the margin.** When deciding whether to perform an action, the only costs and benefits that are relevant are those that would result from taking the action. It is important to ignore sunk costs—those costs that cannot be avoided even if the action isn't taken. Even though a ticket to a concert may have cost you $100, if you've already bought it and cannot sell it to anyone else, the $100 is a sunk cost and shouldn't influence your decision about whether to go to the concert. It's also important not to confuse average costs and benefits with marginal costs and benefits. Decision makers often have ready information about the total cost and benefit of an activity, and from these it's simple to compute the activity's average cost and benefit. A common mistake is to conclude that an activity should be increased if its average benefit exceeds its average cost. The Cost-Benefit Principle tells us that the level of an activity should be increased if, and only if, its *marginal* benefit exceeds its *marginal* cost.

Cost-Benefit

Some costs and benefits, especially marginal costs and benefits and implicit costs, are important for decision making, while others, like sunk costs and average costs and benefits, are essentially irrelevant. This conclusion is implicit in our original statement of the Cost-Benefit Principle (an action should be taken if, and only if, the extra benefits of taking it exceed the extra costs). When we encounter additional examples of decision pitfalls, we will flag them by inserting the icon for the Cost-Benefit Principle as shown here.

NORMATIVE ECONOMICS VERSUS POSITIVE ECONOMICS

The examples discussed in the preceding section make the point that people *sometimes* choose irrationally. We must stress that our purpose in discussing these examples was not to suggest that people *generally* make irrational choices. On the contrary, most people appear to choose sensibly most of the time, especially when their decisions are important or familiar ones. The economist's focus on rational choice thus offers not only useful advice about making better decisions, but also a basis for predicting and explaining human behavior. We used the cost-benefit approach in this way when discussing how rising faculty salaries have led to larger class sizes. And as we will see, similar reasoning helps to explain human behavior in virtually every other domain.

The Cost-Benefit Principle is an example of a **normative economic principle,** one that provides guidance about how we *should* behave. For example, according to the Cost-Benefit Principle, we should ignore sunk costs when making decisions about the future. As our discussion of the various decision pitfalls makes clear, however, the Cost-Benefit Principle is not always a **positive,** or **descriptive, economic principle,** one that describes how we actually *will* behave. As we saw, the Cost-Benefit Principle can be tricky to implement, and people sometimes fail to heed its prescriptions.

normative economic principle one that says how people should behave

positive (or **descriptive**) **economic principle** one that predicts how people will behave

That said, we stress that knowing the relevant costs and benefits surely does enable us to predict how people will behave much of the time. If the benefit of an action goes up, it is generally reasonable to predict that people will be more likely to take that action. And conversely, if the cost of an action goes up, the safest prediction will be that people will be less likely to take that action. This point is so important that we designate it as the *Incentive Principle.*

The Incentive Principle: A person (or a firm or a society) is more likely to take an action if its benefit rises, and less likely to take it if its cost rises. In short, incentives matter.

The Incentive Principle is a positive economic principle. It stresses that the relevant costs and benefits usually help us predict behavior, but at the same time does not insist that people behave rationally in each instance. For example, if the price of heating oil were to rise sharply, we would invoke the Cost-Benefit Principle to say that people *should* turn their thermostats down, and invoke the Incentive Principle to predict that average thermostat settings *will* in fact go down.

ECONOMICS: MICRO AND MACRO

By convention, we use the term **microeconomics** to describe the study of individual choices and of group behavior in individual markets. **Macroeconomics,** by contrast, is the study of the performance of national economies and of the policies that governments use to try to improve that performance. Macroeconomics tries to understand the determinants of such things as the national unemployment rate, the overall price level, and the total value of national output.

microeconomics the study of individual choice under scarcity and its implications for the behavior of prices and quantities in individual markets

macroeconomics the study of the performance of national economies and the policies that governments use to try to improve that performance

Our focus in this chapter is on issues that confront the individual decision maker, whether that individual confronts a personal decision, a family decision, a business decision, a government policy decision, or indeed any other type of decision. Further on, we'll consider economic models of groups of individuals such as all buyers or all sellers in a specific market. Later still we'll turn to broader economic issues and measures.

No matter which of these levels is our focus, however, our thinking will be shaped by the fact that, although economic needs and wants are effectively unlimited, the material and human resources that can be used to satisfy them are finite. Clear thinking about economic problems must therefore always take into account the idea of trade-offs—the idea that having more of one good thing usually means having less of another. Our economy and our society are shaped to a substantial degree by the choices people have made when faced with trade-offs.

THE APPROACH OF THIS TEXT

Scarcity

Choosing the number of students to register in each class is just one of many important decisions in planning an introductory economics course. Another, to which the Scarcity Principle applies just as strongly, concerns which topics to include on the course syllabus. There's a virtually inexhaustible set of issues that might be covered in an introductory course, but only limited time in which to cover them. There's no free lunch. Covering some inevitably means omitting others.

All textbook authors are forced to pick and choose. A textbook that covered *all* the issues would take up more than a whole floor of your campus library. It is our firm view that most introductory textbooks try to cover far too much. One reason that each of us was drawn to the study of economics is that a relatively short list of the discipline's core ideas can explain a great deal of the behavior and events we see in the world around us. So rather than cover a large number of ideas at a superficial level, our strategy is to focus on this short list of core ideas, returning to each entry again and again, in many different contexts. This strategy will enable you to internalize these ideas remarkably well in the brief span of a single course. And the benefit of learning a small number of important ideas well will far outweigh the cost of having to ignore a host of other, less important ones.

So far, we've already encountered three core ideas: the Scarcity Principle, the Cost-Benefit Principle, and the Incentive Principle. As these core ideas reemerge in the course of our discussions, we'll call your attention to them. And shortly after a *new* core idea appears, we'll highlight it by formally restating it.

A second important element in our philosophy is a belief in the importance of active learning. In the same way that you can learn Spanish only by speaking and writing it, or tennis only by playing the game, you can learn economics only by *doing* economics. And because we want you to learn how to do economics, rather than just to read or listen passively as the authors or your instructor does economics, we'll make every effort to encourage you to stay actively involved.

For example, instead of just telling you about an idea, we'll usually first motivate the idea by showing you how it works in the context of a specific example. Often, these examples will be followed by concept checks for you to try, as well as applications that show the relevance of the idea to real life. Try working the concept checks *before* looking up the answers (which are at the back of the corresponding chapter).

Think critically about the applications: Do you see how they illustrate the point being made? Do they give you new insight into the issue? Work the problems at the end of the chapters and take extra care with those relating to points that you don't fully understand. Apply economic principles to the world around you. (We'll say more about this when we discuss economic naturalism below.) Finally, when you come across an idea or example that you find interesting, tell a friend about it. You'll be surprised to discover how much the mere act of explaining it helps you understand and remember the underlying principle. The more actively you can become engaged in the learning process, the more effective your learning will be.

ECONOMIC NATURALISM

With the rudiments of the cost-benefit framework under your belt, you are now in a position to become an "economic naturalist," someone who uses insights from economics to help make sense of observations from everyday life. People who have studied biology are able to observe and marvel at many details of nature that would otherwise have escaped their notice. For example, on a walk in the woods in early April, the novice may see only trees. In contrast, the biology student notices many different species of trees and understands why some are already in leaf while others still lie dormant. Likewise, the novice may notice that in some animal species males are much larger than females, but the biology student knows that pattern occurs only in species in which males take several mates. Natural selection favors larger males in those species because their greater size

helps them prevail in the often bloody contests among males for access to females. In contrast, males tend to be roughly the same size as females in monogamous species, in which there is much less fighting for mates.

Learning a few simple economic principles broadens our vision in a similar way. It enables us to see the mundane details of ordinary human existence in a new light. Whereas the uninitiated often fail even to notice these details, the economic naturalist not only sees them, but becomes actively engaged in the attempt to understand them. Let's consider a few examples of questions economic naturalists might pose for themselves.

The Economic Naturalist 1.1

Why do many hardware manufacturers include more than $1,000 worth of "free" software with a computer selling for only slightly more than that?

The software industry is different from many others in the sense that its customers care a great deal about product compatibility. When you and your classmates are working on a project together, for example, your task will be much simpler if you all use the same word-processing program. Likewise, an executive's life will be easier at tax time if her financial software is the same as her accountant's.

The implication is that the benefit of owning and using any given software program increases with the number of other people who use that same product. This unusual relationship gives the producers of the most popular programs an enormous advantage and often makes it hard for new programs to break into the market.

Recognizing this pattern, Intuit Corp. offered computer makers free copies of *Quicken*, its personal financial-management software. Computer makers, for their part, were only too happy to include the program because it made their new computers more attractive to buyers. *Quicken* soon became the standard for personal financial-management programs. By giving away free copies of the program, Intuit "primed the pump," creating an enormous demand for upgrades of *Quicken* and for more advanced versions of related software. Thus, *TurboTax*, Intuit's personal income-tax software, has become the standard for tax-preparation programs.

Inspired by this success story, other software developers have jumped onto the bandwagon. Most hardware now comes bundled with a host of free software programs. Some software developers are even rumored to *pay* computer makers to include their programs!

The Economic Naturalist 1.1 illustrates a case in which the *benefit* of a product depends on the number of other people who own that product. As the next Economic Naturalist demonstrates, the *cost* of a product may also depend on the number of others who own it.

The Economic Naturalist 1.2

Why don't auto manufacturers make cars without heaters?

Virtually every new car sold in the United States today has a heater. But not every car has a satellite navigation system. Why this difference?

One might be tempted to answer that, although everyone *needs* a heater, people can get along without navigation systems. Yet heaters are of little use in places like Hawaii and southern California. What is more, cars produced as recently as the 1950s did *not* all have heaters. (The classified ad that led one young economic naturalist to his first car, a 1955 Pontiac, boasted that the vehicle had a radio, heater, and whitewall tires.)

Although heaters cost extra money to manufacture and are not useful in all parts of the country, they do not cost *much* money and are useful on at least a few days each year in most parts of the country. As time passed and people's incomes grew, manufacturers found that people were ordering fewer and fewer cars without heaters. At some point it actually became cheaper to put heaters in *all* cars, rather than bear the administrative expense of making some cars with heaters and others without. No doubt a few buyers would still order a car without a heater if they could save some money in the process, but catering to these customers is just no longer worth it.

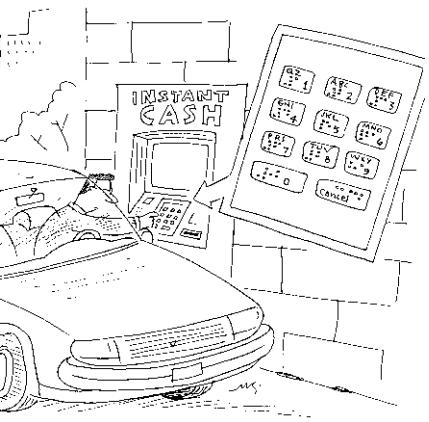
Similar reasoning explains why certain cars today cannot be purchased without a satellite navigation system. Buyers of the 2018 BMW 750i, for example, got one whether they wanted it or not. Most buyers of this car, which sells for more than $75,000, have high incomes, so the overwhelming majority of them would have chosen to order a navigation system had it been sold as an option. Because of the savings made possible when all cars are produced with the same equipment, it would have actually cost BMW more to supply cars for the few who would want them without navigation systems.

Buyers of the least-expensive makes of car have much lower incomes on average than BMW 750i buyers. Accordingly, most of them have more pressing alternative uses for their money than to buy navigation systems for their cars, and this explains why some inexpensive makes continue to offer navigation systems only as options. But as incomes continue to grow, new cars without navigation systems will eventually disappear.

The insights afforded by The Economic Naturalist 1.2 suggest an answer to the following strange question:

The Economic Naturalist 1.3

Why do the keypad buttons on drive-up automated teller machines have Braille dots?



Why do the keypad buttons on drive-up automated teller machines have Braille dots?

Braille dots on elevator buttons and on the keypads of walk-up automated teller machines enable blind people to participate more fully in the normal flow of daily activity. But even though blind people can do many remarkable things, they cannot drive automobiles on public roads. Why, then, do the manufacturers of automated teller machines install Braille dots on the machines at drive-up locations?

The answer to this riddle is that once the keypad molds have been manufactured, the cost of producing buttons with Braille dots is no higher than the cost of producing smooth buttons. Making both would require separate sets of molds and two different types of inventory. If the patrons of drive-up machines found buttons with Braille dots harder to use, there might be a reason to incur these extra costs. But since the dots pose no difficulty for sighted users, the best and cheapest solution is to produce only keypads with dots.

The preceding example was suggested by Cornell student Bill Tjoa, in response to the following assignment:

CONCEPT CHECK 1.6

In 500 words or less, use cost-benefit analysis to explain some pattern of events or behavior you have observed in your own environment.

There is probably no more useful step you can take in your study of economics than to perform several versions of the assignment in Concept Check 1.6. Students who do so almost invariably become lifelong economic naturalists. Their mastery of economic concepts not only does not decay with the passage of time, but it actually grows stronger. We urge you, in the strongest possible terms, to make this investment!

SUMMARY

- Economics is the study of how people make choices under conditions of scarcity and of the results of those choices for society. Economic analysis of human behavior begins with the assumption that people are rational—that they have well-defined goals and try to achieve them as best they can. In trying to achieve their goals, people normally face trade-offs: Because material and human resources are limited, having more of one good thing means making do with less of some other good thing. *(LO1)*
- Our focus in this chapter has been on how rational people make choices among alternative courses of action. Our basic tool for analyzing these decisions is cost-benefit analysis. The Cost-Benefit Principle says that a person should take an action if, and only if, the benefit of that action is at least as great as its cost. The benefit of an action is defined as the largest dollar amount the person would be willing to pay in order to take the action. The cost of an action is defined as the dollar value of everything the person must give up in order to take the action. *(LO2)*
- In using the cost-benefit framework, we need not presume that people choose rationally all the time. Indeed, we identified three common pitfalls that plague decision makers in all walks of life: a tendency to treat small proportional changes as insignificant, a tendency to ignore implicit costs, and a tendency to fail to think at the margin—for example, by failing to ignore sunk costs or by failing to compare marginal costs and benefits. *(LO3)*
- Often the question is not whether to pursue an activity but rather how many units of it to pursue. In these cases, the rational person pursues additional units as long as the marginal benefit of the activity (the benefit from pursuing an additional unit of it) exceeds its marginal cost (the cost of pursuing an additional unit of it). *(LO4)*
- Microeconomics is the study of individual choices and of group behavior in individual markets, while macroeconomics is the study of the performance of national economics and of the policies that governments use to try to improve economic performance.

CORE PRINCIPLES

The Scarcity Principle (also called the No-Free-Lunch Principle)
Although we have boundless needs and wants, the resources available to us are limited. So having more of one good thing usually means having less of another.

The Cost-Benefit Principle
An individual (or a firm or a society) should take an action if, and only if, the extra benefits from taking the action are at least as great as the extra costs.

The Incentive Principle
A person (or a firm or a society) is more likely to take an action if its benefit rises, and less likely to take it if its cost rises. In short, incentives matter.

KEY TERMS

average benefit
average cost
economic surplus
economics
macroeconomics
marginal benefit
marginal cost
microeconomics
normative economic principle
opportunity cost
positive economic principle
rational person
sunk cost

REVIEW QUESTIONS

1. A friend of yours on the tennis team says, "Private tennis lessons are definitely better than group lessons." Explain what you think he means by this statement. Then use the Cost-Benefit Principle to explain why private lessons are not necessarily the best choice for everyone. *(LO2)*
2. True or false: Your willingness to drive downtown to save $30 on a new appliance should depend on what fraction of the total selling price $30 is. Explain. *(LO3)*
3. Why might someone who is trying to decide whether to see a movie be more likely to focus on the $10 ticket price than on the $20 she would fail to earn by not babysitting? *(LO3)*
4. Many people think of their air travel as being free when they use frequent-flyer coupons. Explain why these people are likely to make wasteful travel decisions. *(LO3)*
5. Is the nonrefundable tuition payment you made to your university this semester a sunk cost? How would your answer differ if your university were to offer a full tuition refund to any student who dropped out of school during the first two months of the semester? *(LO3)*

PROBLEMS

1. Suppose the most you would be willing to pay to have a freshly washed car before going out on a date is $6. The smallest amount for which you would be willing to wash someone else's car is $3.50. You are going out this evening and your car is dirty. How much economic surplus would you receive from washing it? *(LO2)*
2. To earn extra money in the summer, you grow tomatoes and sell them at a local farmers' market for 30 cents per pound. By adding compost to your garden, you can increase your yield as shown in the accompanying table. If compost costs 50 cents per pound and your goal is to make as much profit as possible, how many pounds of compost should you add? *(LO2)*

Pounds of compost	Pounds of tomatoes
	100
1	120
2	125
3	128
4	130
5	131
6	131.5

3* You and your friend Joe have identical tastes. At 2 p.m., you go to the local Ticketmaster outlet and buy a nonrefundable $30 ticket to a basketball game to be played that night in Syracuse, 50 miles north of your home in Ithaca. Joe plans to attend the same game, but because he cannot get to the Ticketmaster outlet, he plans to buy his ticket at the game. Tickets sold at the game cost only $25 because they carry no Ticketmaster surcharge. (Many people nonetheless pay the higher price at Ticketmaster, to be sure of getting good seats.) At 4 p.m., an unexpected snowstorm begins, making the prospect of the drive to Syracuse much less attractive than before (but ensuring the availability of good seats). If both you and Joe are rational, is one of you more likely to attend the game than the other? *(LO2)*

4. Tom is a mushroom farmer. He invests all his spare cash in additional mushrooms, which grow on otherwise useless land behind his barn. The mushrooms double in weight during their first year, after which time they are harvested and sold at a constant price per pound. Tom's friend Dick asks Tom for a loan of $200, which he promises to repay after one year. How much interest will Dick have to pay Tom in order for Tom to recover his opportunity cost of making the loan? Explain briefly. *(LO3)*
5. Suppose that in the last few seconds you devoted to question 1 on your physics exam you earned 4 extra points, while in the last few seconds you devoted to question 2 you earned 10 extra points. You earned a total of 48 and 12 points, respectively, on the two questions, and the total time you spent on each was the same. If you could take the exam again, how—if at all—should you reallocate your time between these questions? *(LO3)*
6. Martha and Sarah have the same preferences and incomes. Just as Martha arrived at the theater to see a play, she discovered that she had lost the $10 ticket she had purchased earlier. Sarah also just arrived at the theater planning to buy a ticket to see the same play when she discovered that she had lost a $10 bill from her wallet. If both Martha and Sarah are rational and both still have enough money to pay for a ticket, is one of them more likely than the other to go ahead and see the play anyway? *(LO3)*

*Denotes more difficult problem.

7. Residents of your city are charged a fixed weekly fee of $6 for garbage collection. They are allowed to put out as many cans as they wish. The average household disposes of three cans of garbage per week under this plan. Now suppose that your city changes to a "tag" system. Each can of garbage to be collected must have a tag affixed to it. The tags cost $2 each and are not reusable. What effect do you think the introduction of the tag system will have on the total quantity of garbage collected in your city? Explain briefly. *(LO4)*

8. Once a week, Smith purchases a six-pack of cola and puts it in his refrigerator for his two children. He invariably discovers that all six cans are gone on the first day. Jones also purchases a six-pack of cola once a week for his two children, but unlike Smith, he tells them that each may drink no more than three cans per week. If the children use cost-benefit analysis each time they decide whether to drink a can of cola, explain why the cola lasts much longer at Jones's house than at Smith's. *(LO4)*

9.* For each long-distance call anywhere in the continental United States, a new phone service will charge users 30 cents per minute for the first 2 minutes and 2 cents per minute for additional minutes in each call. Tom's current phone service charges 10 cents per minute for all calls, and his calls are never shorter than 7 minutes. If Tom's dorm switches to the new phone service, what will happen to the average length of his calls? *(LO4)*

10.* The meal plan at University A lets students eat as much as they like for a fixed fee of $500 per semester. The average student there eats 250 pounds of food per semester. University B charges $500 for a book of meal tickets that entitles the student to eat 250 pounds of food per semester. If the student eats more than 250 pounds, he or she pays $2 for each additional pound; if the student eats less, he or she gets a $2 per pound refund. If students are rational, at which university will average food consumption be higher? Explain briefly. *(LO4)*

ANSWERS TO CONCEPT CHECKS

1.1 The benefit of buying the game downtown is again $10 but the cost is now $12, so your economic surplus would be $2 smaller than if you'd bought it at the campus store. *(LO2)*

1.2 Saving $100 is $10 more valuable than saving $90, even though the percentage saved is much greater in the case of the Chicago ticket. *(LO3)*

1.3 Since you now have no alternative use for your coupon, the opportunity cost of using it to pay for the Cancun trip is zero. That means your economic surplus from the trip will be $\$1{,}350 - \$1{,}000 = \$350 > 0$, so you should use your coupon and go to Cancun. *(LO3)*

1.4 The marginal benefit of the fourth launch is $9 billion, which exceeds its marginal cost of $8 billion, so the fourth launch should be added. But the fifth launch should not, because its marginal cost ($12 billion) exceeds its marginal benefit ($9 billion). *(LO3)*

1.5 If the star player takes one more shot, some other player must take one less. The fact that the star player's *average* success rate is higher than the other players' does not mean that the probability of making his *next* shot (the marginal benefit of having him shoot once more) is higher than the probability of another player making his next shot. Indeed, if the best player took all his team's shots, the other team would focus its defensive effort entirely on him, in which case letting others shoot would definitely pay. *(LO3)*

*Denotes more difficult problem.

APPENDIX

Working with Equations, Graphs, and Tables

Although many of the examples and most of the end-of-chapter problems in this book are quantitative, none requires mathematical skills beyond rudimentary high school algebra and geometry. In this brief appendix, we review some of the skills you'll need for dealing with these examples and problems.

One important skill is to be able to read simple verbal descriptions and translate the information they provide into the relevant equations or graphs. You'll also need to be able to translate information given in tabular form into an equation or graph, and sometimes you'll need to translate graphical information into a table or equation. Finally, you'll need to be able to solve simple systems with two equations and two unknowns. The following examples illustrate all the tools you'll need.

USING A VERBAL DESCRIPTION TO CONSTRUCT AN EQUATION

We begin with an example that shows how to construct a long-distance telephone billing equation from a verbal description of the billing plan.

EXAMPLE 1A.1 A Verbal Description

Your long-distance telephone plan charges you $5 per month plus 10 cents per minute for long-distance calls. Write an equation that describes your monthly telephone bill.

equation a mathematical expression that describes the relationship between two or more variables

variable a quantity that is free to take a range of different values

dependent variable a variable in an equation whose value is determined by the value taken by another variable in the equation

independent variable a variable in an equation whose value determines the value taken by another variable in the equation

constant (or **parameter**) a quantity that is fixed in value

An **equation** is a simple mathematical expression that describes the relationship between two or more **variables,** or quantities that are free to assume different values in some range. The most common type of equation we'll work with contains two types of variables: **dependent variables** and **independent variables.** In this example, the dependent variable is the dollar amount of your monthly telephone bill and the independent variable is the variable on which your bill depends, namely, the volume of long-distance calls you make during the month. Your bill also depends on the $5 monthly fee and the 10 cents per minute charge. But, in this example, those amounts are **constants,** not variables. A constant, also called a **parameter,** is a quantity in an equation that is fixed in value, not free to vary. As the terms suggest, the dependent variable describes an outcome that depends on the value taken by the independent variable.

Once you've identified the dependent variable and the independent variable, choose simple symbols to represent them. In algebra courses, X is typically used to represent the independent variable and Y the dependent variable. Many people find it easier to remember what the variables stand for, however, if they choose symbols that are linked in some straightforward way to the quantities that the

variables represent. Thus, in this example, we might use B to represent your monthly *bill* in dollars and T to represent the total *time* in minutes you spent during the month on long-distance calls.

Having identified the relevant variables and chosen symbols to represent them, you are now in a position to write the equation that links them:

$$B = 5 + 0.10T, \tag{1A.1}$$

where B is your monthly long-distance bill in dollars and T is your monthly total long-distance calling time in minutes. The fixed monthly fee (5) and the charge per minute (0.10) are parameters in this equation. Note the importance of being clear about the units of measure. Because B represents the monthly bill in dollars, we must also express the fixed monthly fee and the per-minute charge in dollars, which is why the latter number appears in Equation 1A.1 as 0.10 rather than 10. Equation 1A.1 follows the normal convention in which the dependent variable appears by itself on the left-hand side while the independent variable or variables and constants appear on the right-hand side.

Once we have the equation for the monthly bill, we can use it to calculate how much you'll owe as a function of your monthly volume of long-distance calls. For example, if you make 32 minutes of calls, you can calculate your monthly bill by simply substituting 32 minutes for T in Equation 1A.1:

$$B = 5 + 0.10(32) = 8.20. \tag{1A.2}$$

Your monthly bill when you make 32 minutes of calls is thus equal to \$8.20.

CONCEPT CHECK 1A.1

Under the monthly billing plan described in Example 1A.1, how much would you owe for a month during which you made 45 minutes of long-distance calls?

GRAPHING THE EQUATION OF A STRAIGHT LINE

The next example shows how to portray the billing plan described in Example 1A.1 as a graph.

EXAMPLE 1A.2 Graphing an Equation

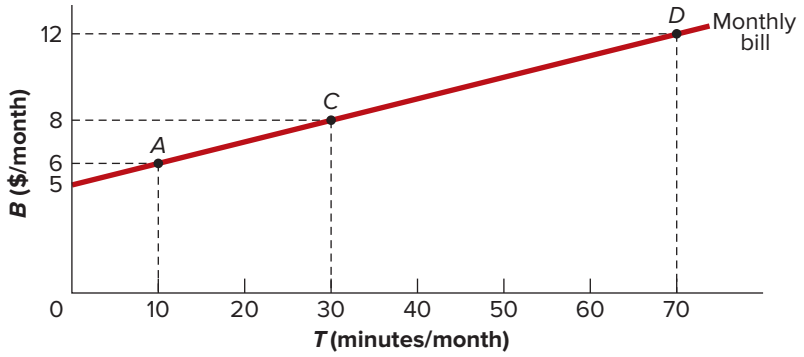
Construct a graph that portrays the monthly long-distance telephone billing plan described in Example 1A.1, putting your telephone charges, in dollars per month, on the vertical axis and your total volume of calls, in minutes per month, on the horizontal axis.

The first step in responding to this instruction is the one we just took, namely, to translate the verbal description of the billing plan into an equation. When graphing an equation, the normal convention is to use the vertical axis to represent the dependent variable and the horizontal axis to represent the independent variable. In Figure 1A.1, we therefore put B on the vertical axis and T on the horizontal axis. One way to construct the graph shown in the figure is to begin by plotting the monthly bill values that correspond to several different total amounts of long-distance calls. For example, someone who makes 10 minutes of calls during the month would have a bill of $B = 5 + 0.10(10) = \$6$. Thus, in Figure 1A.1 the value of 10 minutes per month on the horizontal axis corresponds to a bill of \$6 per month on the vertical axis (point A). Someone who makes 30 minutes of long-distance calls during the month will have a monthly bill of $B = 5 + 0.10(30) = \$8$,

FIGURE 1A.1

The Monthly Telephone Bill in Example 1A.1.

The graph of the equation $B = 5 + 0.10T$ is the straight line shown. Its vertical intercept is 5 and its slope is 0.10.



so the value of 30 minutes per month on the horizontal axis corresponds to $8 per month on the vertical axis (point *C*). Similarly, someone who makes 70 minutes of long-distance calls during the month will have a monthly bill of $B = 5 + 0.10(70) = \$12$, so the value of 70 minutes on the horizontal axis corresponds to $12 on the vertical axis (point *D*). The line joining these points is the graph of the monthly billing Equation 1A.1.

vertical intercept in a straight line, the value taken by the dependent variable when the independent variable equals zero

slope in a straight line, the ratio of the vertical distance the straight line travels between any two points ***(rise)*** to the corresponding horizontal distance ***(run)***

As shown in Figure 1A.1, the graph of the equation $B = 5 + 0.10T$ is a straight line. The parameter 5 is the **vertical intercept** of the line—the value of *B* when $T = 0$, or the point at which the line intersects the vertical axis. The parameter 0.10 is the **slope** of the line, which is the ratio of the **rise** of the line to the corresponding **run.** The ratio rise/run is simply the vertical distance between any two points on the line divided by the horizontal distance between those points. For example, if we choose points *A* and *C* in Figure 1A.1, the rise is $8 - 6 = 2$ and the corresponding run is $30 - 10 = 20$, so rise/run $= 2/20 = 0.10$. More generally, for the graph of any equation $Y = a + bX$, the parameter *a* is the vertical intercept and the parameter *b* is the slope.

DERIVING THE EQUATION OF A STRAIGHT LINE FROM ITS GRAPH

The next example shows how to derive the equation for a straight line from a graph of the line.

EXAMPLE 1A.3 Deriving an Equation from a Graph

Figure 1A.2 shows the graph of the monthly billing plan for a new long-distance plan. What is the equation for this graph? How much is the fixed monthly fee under this plan? How much is the charge per minute?

The slope of the line shown is the rise between any two points divided by the corresponding run. For points *A* and *C*, rise $= 12 - 8 = 4$ and run $= 40 - 20 = 20$, so the slope equals rise/run $= 4/20 = 1/5 = 0.20$. And since the horizontal intercept of the line is 4, its equation must be given by

$$B = 4 + 0.20T. \qquad (1A.3)$$

Under this plan, the fixed monthly fee is the value of the bill when $T = 0$, which is $4. The charge per minute is the slope of the billing line, 0.20, or 20 cents per minute.