INTERMEDIATE MICROECONOMICS

AND ITS APPLICATION

Walter Nicholson ■ Christopher Snyder

TWELFTH EDITION

Intermediate Microeconomics and Its Application

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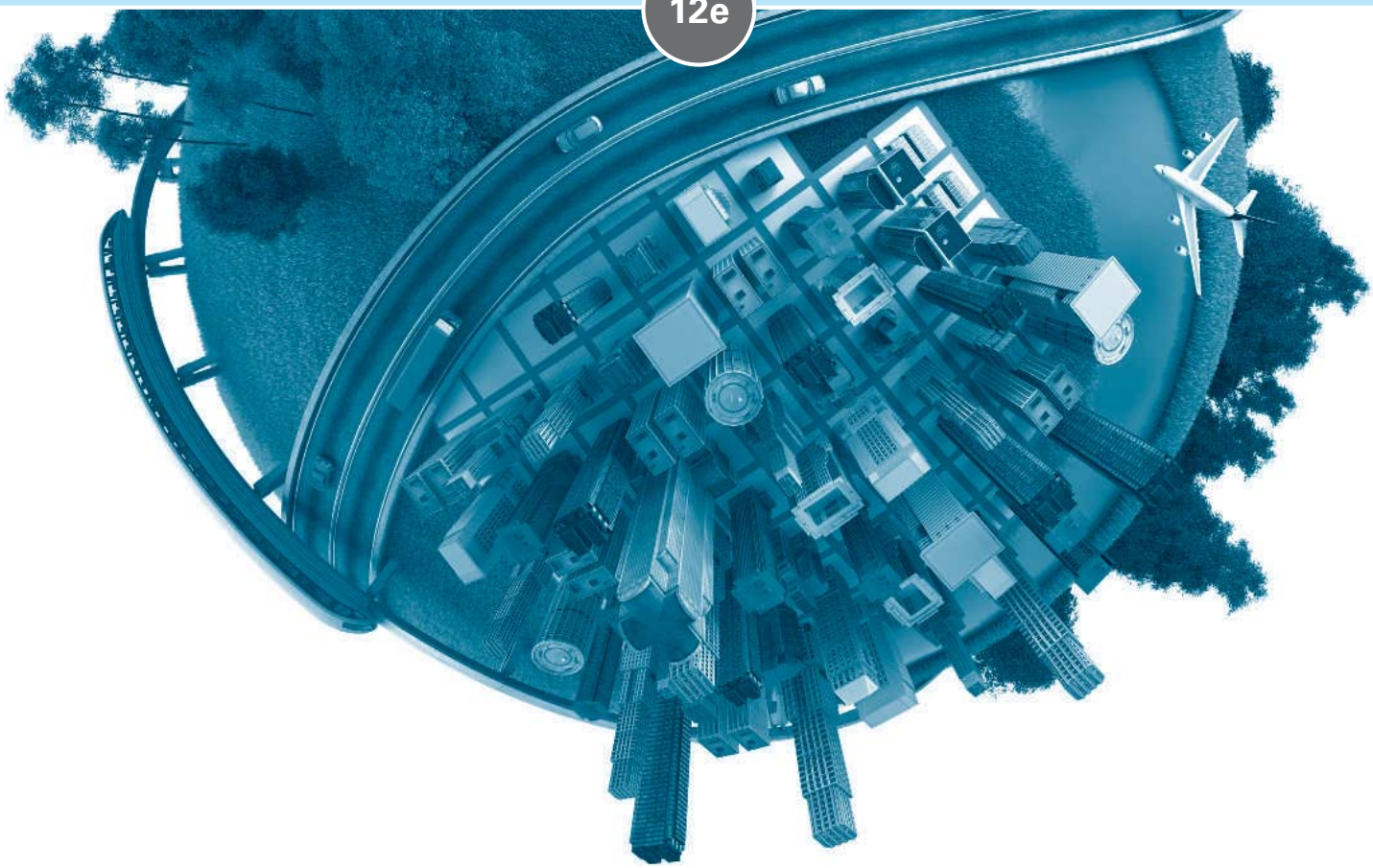

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Walter Nicholson and Christopher Snyder

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Dedication

To my grandchildren: Elizabeth, Sarah, David, Sophia, Abigail, Nathaniel, Christopher, and Ava

Walter Nicholson

To my daughters: Clare, Tess, and Meg

Christopher Snyder

About the Authors

Walter Nicholson Walter Nicholson is the Ward H. Patton Professor of Economics, *Emeritus*, at Amherst College and a Visiting Professor at Ave Maria University. He received a B.A. in mathematics from Williams College and a Ph.D. in economics from the Massachusetts Institute of Technology. Professor Nicholson's primary research interests are in the econometric analyses of labor market problems and of policies to address them including unemployment compensation, job training programs, welfare policies, and trade adjustment assistance. Professor Nicholson is also a Senior Fellow at Mathematica Policy Research and an advisor on labor market policies to the U.S. and Canadian governments. He and his wife Susan live in Naples, Florida and Montague, Massachusetts.

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Brief Contents

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Preface

We are proud to introduce the twelfth edition of *Intermediate Microeconomics and its Application*. Overall, this edition does everything the previous edition did, just better. We maintained the same basic organization and topics, but where possible, improved how the material is presented. In the end, every chapter has seen dozens of minor improvements, but several chapters, including those on uncertainty, costs, and asymmetric information, have been extensively revised. The book has a fresh look, with an appealing use of color and formatting that should make the text more fun to read and easier to follow. All the changes serve to improve what we think are the book's strengths: clarity and conciseness in its treatment of intermediate microeconomics.

This edition marks the introduction of an electronic version including enhancements that should prove valuable to instructors and students alike. Every chapter has two or three videos linked to the content. Many of the videos provide step-by-step solutions to key end-of-chapter problems narrated by one or another of the authors themselves. In addition to guiding the student through the steps, the authors try to emphasize the broader economic insights that the problem is trying to illustrate. Some videos focus on a single concept or a numerical exercise from the text. Instructors can use these videos as part of the answer key to problem sets, saving countless office hours. Instructors can also use the videos to enhance lectures, giving students some independent instruction outside of class, saving class time for deeper discussions or "flipping" the classroom while preserving for students a strong foundation of the basics. The End-of-Chapter problems with videos are clearly identify in the textbook with a video icon. These videos are available on CourseMate, the e-Reader, Aplia's media reader, and on the Single Sign On (SSO) for instructors.

The electronic version, CourseMate, is a highly interactive learning experience combining readings, multimedia activities, and assessments in a single online resource center. The rich media reader guides students to seamlessly move to referenced content in a way that is convenient even for the smaller devices—tablets and mobile phones.

Some of the more important changes to the content of the chapters in this edition include the following.

- Streamlining Chapter 4 on uncertainty. Where before we introduced two models of risk and insurance in the text, now we focus on the utility-of-income curve in the text and present a streamlined version of the two-state model in an appendix. This makes the chapter more coherent and digestible to the student.
- Expanding and clarifying the discussion of cost concepts in Chapter 7. We carefully explain the settings in which accounting costs, economic costs, and opportunity costs are synonyms and when they are distinct, using examples that should be compelling to students (college attendance and vacation rentals). We expand on the discussion of sunk costs, so important to later discussions of strategic commitment and option value, as a special case of fixed costs. We relate economies of scale, a characteristic of cost functions, to returns to scale, introduced in the prior chapter as a characteristic of production functions.

- Streamlining Chapter 15 on asymmetric information. By simplifying the language and redrafting the figures, we were able to clarify the discussions of moral hazard and adverse selection while cutting the length almost in half. We hope this encourages some instructors to add some of these topics to the syllabus.
- Adding in-chapter numerical illustrations. More of these invaluable aids to student understanding have been added to Chapter 15 and a number of other chapters.
- Adding new end-of-chapter problems. The new problems added to a handful of chapters focus ensure students have additional practice with the key take-away points in each chapter. We tried to keep these problems tractable to help all levels of students master the basics. Some of these new problems are featured in the video solutions.
- Adding a few calculus-related footnotes. The footnotes show the curious student how some key results can be derived mathematically without disrupting the flow of the text for students without a calculus background.

We believe that the boxed applications in this book are a great device for getting students interested in economics, so we devoted considerable attention to revising them in this edition. All the facts, figures, and policies have been updated. The general topics in most of the over one hundred applications have mainly been preserved, so instructors can be assured their favorites still appear in the book, but dozens have been extensively rewritten, adding more probing questions to think about, substituting new markets and exciting developments as case studies. Some examples include:

- the introduction of the iPad;
- new airline pricing schemes;
- the fracking debate;
- regulatory changes in markets as diverse as finance, utilities, and casket sales;
- penny auctions on the internet;
- satellite television and movie-streaming services.

We hope that the breadth of coverage of these applications will show students the wide array of topics to which economic analysis can be fruitfully applied.

To The Instructor

We have tried to organize this book in a way that most instructors will want to use it. We proceed in a very standard way through the topics of demand, supply, competitive equilibrium, and market structure before covering supplemental topics such as input markets, asymmetric information, or externalities. There are two important organizational decisions that instructors will need to make depending on their preferences. First is a decision about where to cover uncertainty and game theory. We have placed these topics near the front of the book (Chapters 4 and 5), right after the development of demand curves. The purpose of such an early placement is to provide students with some tools that they may find useful in subsequent chapters. But some users may find coverage of these topics so early in the course to be distracting and may therefore prefer to delay them until later. In any case, they should be covered before the material on imperfect competition (Chapter 12) because that chapter makes extensive use of game theory concepts.

A second decision that must be made concerns our new chapter on behavioral economics (Chapter 17). We have placed this chapter at the end because it represents a

departure from the paradigm used throughout the rest of the book. We realize that many instructors may not have the time or inclination to cover this additional topic. For those that do, one suggestion would be to cover it at the end of the term, providing students with an appreciation of the fact that economics is not cut-and-dried but is continually evolving as new ideas are proposed, tested, and refined. Another suggestion would be to sprinkle a few behavioral topics into the relevant places in the chapters on consumer choice, uncertainty, and game theory.

Some of the new digital content should be a big help for instructors who adopt the electronic version for their classes. One set of videos contains a step-by-step solution to a problem from the end of the chapter hand-picked to best capture the core ideas from the chapter. Other videos select a more difficult problem, the sort that sometimes leads to a line in front of the instructor's door during office hours. These and the other videos should save the instructor time in office hours and lecture, time that can be used to carry on deeper discussions of applications or to more easily "flip" the classroom ensuring the students continue to master the basics.

Both of us have thoroughly enjoyed the correspondence we have had with users of our books over the years. If you have a chance, we hope you will let us know what you think of this edition and how it might be improved. Our goal is to provide a book that meshes well with each instructor's specific style. The feedback that we have received has really helped us to develop this edition and we hope this process will continue.

To The Student

We believe that the most important goal of any microeconomics course is to make this material interesting so that you will want to pursue economics further and begin to use its tools in your daily life. For this reason, we hope you will read most of our applications and think about how they might relate to you. But we also want you to realize that the study of economics is not all just interesting "stories." There is a clear body of theory in microeconomics that has been developed over more than two hundred years in an effort to understand the operations of markets. If you are to "think like an economist" you will need to learn this theoretical core. We hope that the attractive format of this book together with its many learning aids will help you in that process. As always, we would be happy to hear from any student who would care to comment on our presentation. We believe this book has been improved immeasurably over the years by replying to students' opinions and criticisms. We hope you will keep these coming. Words of praise would also be appreciated, of course.

Supplements To The Text

A wide and helpful array of supplements is available with this edition to both students and instructors.

- An Instructor's Manual with Test Bank, by Walter Nicholson and Christopher Snyder, contains summaries, lecture and discussion suggestions, a list of glossary terms, solutions to problems, a multiple-choice test bank, and suggested test problems. The Instructor's Manual with Test Bank is available on the text Web site at http://www.cengage.com/ to instructors only.
- Microsoft PowerPoint Slides, revised by Philip S. Heap, James Madison University, are available on the text Web site for use by instructors for enhancing their lectures.

- CourseMate, a powerful on-line resource center, contains quizzes, student resources, solutions to odd numbered problems, and more.
- Cognero, an on-line assessment system, supports the computerized Test Bank. Cognero allows instructors to create and assign tests, deliver tests through a secure on-line test center, and have the complete reporting and data dissemination at their fingertips.

Acknowledgments

Once again it was the professional staff at Cengage and its contractors that made this edition possible. We are grateful to Daniel Noguera and Steven Scoble for helping determine the scope of the revision, for setting up a time line, and for managing the whole process to ensure the deadlines were met. Their vision, encouragement, and advice were instrumental in moving this edition into the digital age with the addition of the video and other digital assets. We owe a special thanks to Malcolm Joseph, who guided the copyediting and production of the book. He took great care to make sure the flurry of handwritten, embedded, and emailed changes all made it into the final manuscript, and made sure the notation, grammar, and tone was maintained across 17 chapters and two authors. Michelle Kunkler managed to devise ways to incorporate the many elements of the book into an attractive whole. We also thank our media editor, Leah Wuchnick, and the marketing team, lead by Katie Jergens, for their respective contributions. Several Dartmouth students provided excellent research assistance. Paulina Karpis reviewed all the applications and helped us update all the facts and figures. Rex Woodbury provided a fresh set of eyes for reviewing the page proofs, ensuring that the text said what we wanted it to say and that all the i's were dotted in the equations.

We certainly owe a debt of gratitude to our families for suffering through another edition of our books. For Walter Nicholson, most of the cost has been born by his wife of 47 years Susan (who should know better by now). Fortunately, his ever expanding set of grandchildren has provided her with a well-deserved escape. The dedication of the book to them is intended both as gratitude to their being here and a feeble attempt to get them to be interested in this ever-fascinating subject.

Christopher Snyder is grateful to his wife Maura for accommodating the long hours needed for this revision and for providing economic insights from her teaching of the material. He is grateful to his daughters, to whom he has dedicated this edition, for expediting the writing process by behaving themselves and for generally being a joy around the house. He also thanks his Dartmouth colleagues for their understanding and for helpful discussions, in particular, with Erin Mansur, John Scott, Josh Schwartzstein, and Jon Zinman.

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June 2014

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June 2014

PART 1

Introduction

"Economics is the study of mankind in the ordinary business of life."
—Alfred Marshall, Principles of Economics, 1890

Part 1 includes only a single background chapter. In it, we will review some basic principles of supply and demand, which should look familiar from your introductory economics course. This review is especially important because supply and demand models serve as a starting point for most of the material covered later in this book.

Mathematical tools are widely used in practically all areas of economics. Although the math used in this book is not especially difficult, the appendix to Chapter 1 provides a brief summary of what you will need to know. Many of these basic principles are usually covered in an elementary algebra course. Most important is the relationship between algebraic functions and the graphs of these functions. Because we will be using graphs heavily throughout the book, it is important to be sure you understand this material before proceeding.

1 Economic Models

You have to deal with prices every day. When planning air travel, for example, you face a bewildering array of possible prices and travel-time restrictions. A cross-country flight can cost anywhere from $200 to $1,200, depending on where you look. How can that be? Surely the cost is the same for an airline to carry each passenger; so why do passengers pay such different prices?

Or, consider buying beer or wine to go with your meal at a restaurant (assuming you meet the unwarranted age restrictions). You will probably have to pay at least $5.95 for wine or beer that would cost no more than $1.00 in a liquor store. How can that be? Why don't people balk at such extreme prices, and why don't restaurants offer a better deal?

Finally, think about prices of houses. During the years 2004–2007, house prices rose dramatically. Annual gains of 25 percent or more were common in areas of high demand, such as California and south Florida. But these increases were not sustainable. Starting in late 2007, housing demand stalled, partly in connection with much higher interest rates on mortgages. By mid-2012, house prices had fallen precipitously. Declines of more than 50 percent occurred in many locations. How can you explain such wild gyrations? Are economic models capable of describing these rapid price moves, or would it be better to study these in a class on the psychology of crowds?

If these are the kinds of questions that interest you, microeconomics is the right course to take. As the quotation in the introduction to this part states, economics (especially microeconomics) is the study of "the ordinary business of life." That is, economists take such things as airfares, house prices, or restaurants' menus as interesting topics, worthy of detailed study. Why? Because understanding these everyday features of our world goes a long way toward understanding the welfare of the actual people who live here. The study of economics cuts through the garble of television sound bites and the hot air of politicians that often obscure rather than enlighten these issues. Our goal here is to help you to understand the market forces that affect all of our lives.

1-1 What Is Microeconomics?

As you probably learned in your introductory course, **economics** is formally defined as the "study of the allocation of scarce resources among alternative uses." This definition stresses that there simply are not enough basic resources (such as land, labor, and capital equipment) in the world to produce everything that people want. Hence, every society must choose, either explicitly or implicitly, how its resources will be used. Of course, such "choices" are usually not made by an all-powerful dictator who specifies every citizen's life in minute detail. Instead, the way resources get allocated is determined by the

Economics
The study of the allocation of scarce resources among alternative uses.

actions of many people who engage in a bewildering variety of economic activities. Many of these activities involve participation in some sort of market transaction. Flying in airplanes, buying houses, and purchasing meals are just three of the practically infinite number of things that people do that have market consequences for them and for society as a whole. **Microeconomics** is the study of all of these choices and of how well the resulting market outcomes meet basic human needs.

Microeconomics
The study of the economic choices individuals and firms make and of how these choices create markets and affect welfare.

Obviously, any real-world economic system is far too complicated to be described in detail. Just think about how many items are available in the typical hardware store (not to mention in the typical Home Depot megastore). Surely it would be impossible to study in detail how each hammer or screwdriver was produced and how many were bought in each store. Not only would such a description take a very long time, but it seems likely no one would care to know such trivia, especially if the information gathered could not be used elsewhere. For this reason, all economists build simple **models** of various activities that they wish to study. These models may not be especially realistic, at least in terms of their ability to capture the details of how a hammer is sold; but, just as scientists use models of the atom or architects use models of what they want to build, economists use simplified models to describe the basic features of markets. Of course, these models are "unrealistic." But maps are unrealistic too—they do not show every house or parking lot. Despite this lack of "realism," maps help you see the overall picture and get you where you want to go. That is precisely what a good economic model should do. The economic models that you will encounter in this book have a wide variety of uses, even though, at first, you may think that some of them are unrealistic. The applications scattered throughout the book are intended to illustrate such practical uses. But they can also suggest the many ways in which the study of microeconomics can help you understand the economic events that affect your life.

Models
Simple theoretical descriptions that capture the essentials of how the economy work.

1-2 A Few Basic Principles

Much of microeconomics consists of simply applying a few basic principles to new situations. We can illustrate some of these by examining an economic model with which you already should be familiar—the **production possibility frontier**. This graph shows the various amounts of two goods that an economy can produce during some period (say, one year). Figure 1.1, for example, shows all the combinations of two goods (say, food and clothing) that can be produced with this economy's resources. For example, 10 units of food and 3 units of clothing can be made, or 4 units of food and 12 units of clothing. Many other combinations of food and clothing can also be produced, and Figure 1.1 shows all of them. Any combination on or inside the frontier can be produced, but combinations of food and clothing outside the frontier cannot be made because there are not enough resources to do so.

Production Possibility Frontier
A graph showing all possible combinations of goods that can be produced with a fixed amount of resources.

This simple model of production illustrates six principles that are common to practically every situation studied in microeconomics:

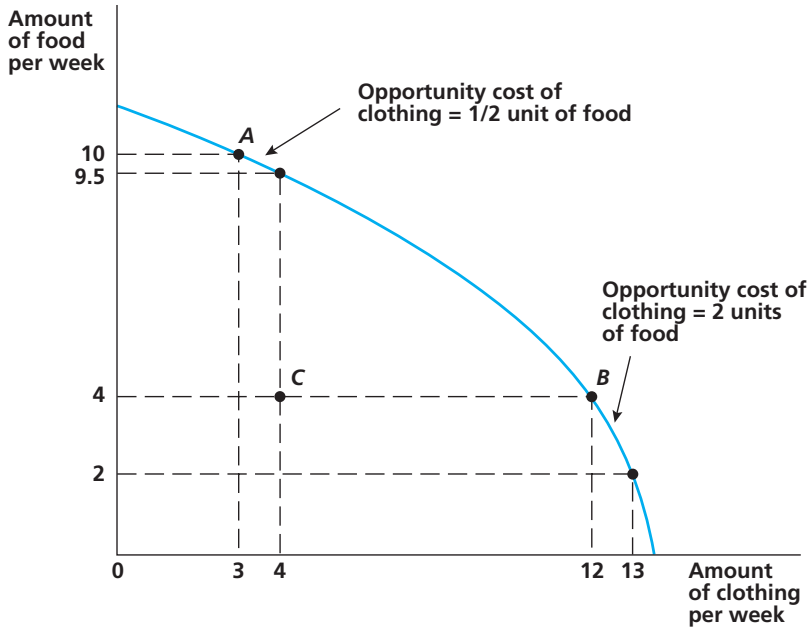
- *Resources are scarce.* Some combinations of food and clothing (such as 10 units of food together with 12 units of clothing) are impossible to make given the resources available. We simply cannot have all of everything we might want.

MICRO QUIZ 1.1

Consider the production possibility frontier shown in Figure 1.1:

1. Why is this curve called a "frontier"?
2. This curve has a "concave" shape. Would the opportunity cost of clothing production increase if the shape of the curve were convex instead?

Figure 1.1 Production Possibility Frontier



The production possibility frontier shows the different combinations of two goods that can be produced from a fixed amount of scarce resources. It also shows the opportunity cost of producing more of one good as the quantity of the other good that cannot then be produced. The opportunity cost at two different levels of production of a good can be seen by comparing points *A* and *B*. Inefficiency is shown by comparing points *B* and *C*.

- *Scarcity involves* ***opportunity costs***. That is, producing more of one good necessarily involves producing less of something else. For example, if this economy produces 10 units of food and 3 units of clothing per year at point *A*, producing 1 more unit of clothing would "cost" one-half unit of food. In other words, to increase the output of clothing by 1 unit means the production of food would have to decrease by one-half unit.
- *Opportunity costs are increasing*. Expanding the output of one particular goodwill usually involves increasing opportunity costs as diminishing returns set in. Although the precise reasons for this will be explained later, Figure 1.1 shows this principle clearly. If clothing output were expanded to 12 units per year (point *B*), the opportunity cost of clothing would rise from one-half a unit of food to 2 units of food. Hence, the opportunity cost of an economic action is not constant but varies with the circumstances.
- *Incentives matter*. When people make economic decisions, they will consider opportunity costs. Only when the extra (marginal) benefits from an action exceed the extra (marginal) opportunity costs will they take the action being considered. Suppose that the economy is operating at a place on its production possibility frontier where the opportunity cost of 1 unit of clothing is 1 unit of food. Then any person could judge whether he or she would prefer more clothing or more food and trade at this ratio. But if, say, there were a 100 percent tax on clothing, it would seem as if you could get only one-half a unit of clothing in exchange for giving up food—so you might choose to eat more and dress in last year's apparel. Or, suppose a rich uncle offers to pay one-half

Opportunity cost
The cost of a good as measured by the alternative uses that are foregone by producing it.

your clothing costs. Now it appears that additional clothing costs only one-half unit of food, so you might choose to dress much better, even though true opportunity costs (as shown on the production possibility frontier) are unchanged. Much of the material in this book looks at the problems that arise in situations like these, when people do not recognize the true opportunity costs of their actions and therefore take actions that are not the best from the perspective of the economy as a whole.

- *Inefficiency involves real costs.* An economy operating inside its production possibility frontier is said to be performing "inefficiently"—a term we will be making more precise later. Producing, say, 4 units of clothing and 4 units of food (at point *C* in Figure 1.1) would constitute an inefficient use of this economy's resources. Such production would involve the loss of, say, 8 units of clothing that could have been produced along with the 4 units of food. When we study why markets might produce such inefficiencies, it will be important to keep in mind that such losses are not purely conceptual, being of interest only to economic researchers. These are real losses. They involve real opportunity costs. Avoiding such costs will make people better off.
- *Whether markets work well is important.* Most economic transactions occur through markets. As we shall see, if markets work well, they can enhance everyone's well-being. But, when markets perform poorly, they can impose real costs on the real economy—that is, they can cause the economy to operate inside its production possibility frontier. Sorting out situations where markets work well from those where they don't is one of the key goals of the study of microeconomics.

In the next section, we show how applying these basic concepts helps in understanding some important economic issues. First, in Application 1.1: Economics in the Natural World? we show how the problem of scarcity and the opportunity costs it entails are universal. It appears that these basic principles can even help explain the choices made by wolves or hawks.

1-3 Uses of Microeconomics

Microeconomic principles have been applied to study practically every aspect of human behavior. The insights gained by applying a few basic ideas to new problems can be far-reaching. For example, in Chapter 11, we see how one economist's initial fascination with the way prices were set for the attractions at Disneyland opened the way for understanding pricing in such complex areas as air travel or the bundling and pricing of Internet connections. In Chapter 15, we look at another economist's attempt to understand the pricing of used cars. The resulting model of the pricing of "lemons" offers surprising insights about how the information available in markets can affect the pricing of such important products as health care and legal services. One must, therefore, be careful in trying to list the ways in which microeconomics is used because new uses are being discovered every day.

One way to categorize the uses of microeconomics is to look at the types of people who use it. At the most basic level, microeconomics has a variety of uses for people in their own lives. An understanding of how markets work can help you make decisions about future jobs, about the wisdom of major purchases (such as houses), or about important financial decisions (such as retirement). Of course, economists are not much better than anyone else in predicting the future. There are legendary examples of economists who in fact made disastrous decisions—perhaps best illustrated by the financial collapse of a "hedge fund" run by two Nobel Prize–winning economists. But the study

APPLICATION 1.1

Economics in the Natural World?

Scarcity is a dominant fact of nature. Indeed, the effect of scarcity is often easier to study in natural environments because they are less complex than modern human societies. In trying to understand the pressures that scarcity imposes on actions, economists and biologists have used models with many similarities. Charles Darwin, the founder of modern evolutionary biology, was well acquainted with the writings of the major eighteenth- and nineteenth-century economists. Their thinking helped to sharpen his insights in *The Origin of Species*. Here we look at the ways in which economic principles are illustrated in the natural world.

Foraging for Food

All animals must use time and energy in their daily search for food. In many ways, this poses an "economic" problem for them in deciding how to use these resources most effectively. Biologists have developed general theories of animal-foraging behavior that draw largely on economic notions of weighing the (marginal) benefits and costs associated with various ways of finding food.[1]

Two examples illustrate this "economic" approach to foraging. First, in the study of birds of prey (eagles, hawks, and so forth), biologists have found that the length of time a bird will hunt in a particular area is determined both by the prevalence of food in that area and by the flight time to another location. These hunters recognize a clear trade-off between spending time and energy looking in one area and using those same resources to go somewhere else. Factors such as the types of food available and the mechanics of the bird's flight can explain observed hunting behavior.

A related observation about foraging behavior is the fact that no animal will stay in a given area until all of the food there is exhausted. For example, once a relatively large portion of the prey in a particular area has been caught, a hawk will go elsewhere. Similarly, studies of honeybees have found that they generally do not gather all of the nectar in a particular flower before moving on. To collect the last drop of nectar is not worth the time and energy the bee must expend to get it. Such weighing of marginal benefits and costs is precisely what an economist would predict.

Scarcity and Human Evolution

Charles Darwin's greatest discovery was the theory of evolution. Later research has tended to confirm his views that species evolve biologically over long periods of time in ways that adapt to their changing natural environments. In that process, scarcity plays a major role. For example, many of Darwin's conclusions were drawn from his study of finches on the Galápagos Islands. He discovered that these birds had evolved in ways that made it possible to thrive in that rather inhospitable locale. Specifically, they had developed strong jaws and beaks that made it possible for them to crack open nuts that are the only source of food during droughts.

It may even be the case that the evolution of economic-type activities led to the emergence of human beings. About 50,000 years ago *Homo sapiens* were engaged in active competition with Neanderthals. Although the fact that *Homo sapiens* eventually won out is usually attributed to their superior brainpower, some research suggests that this dominance may have derived instead from superior economic organization. Specifically, it appears that our forerunners were better at specialization in production and in trade than were Neanderthals. *Homo sapiens* made better use of the resources available than did Neanderthals.[2] Hence, Adam Smith's observation that humans have "the propensity to truck, barter, and trade one thing for another"[3] may indeed reflect an evolutionarily valuable aspect of human nature.

TO THINK ABOUT

1. Does it make sense to assume that animals consciously choose an optimal strategy for dealing with the scarcity of resources (see the discussion of Friedman's pool player later in this chapter)?
2. Why do some companies grow whereas others decline? Name one company for which the failure to adapt to a changing environment was catastrophic.

[1]See, for example, David W. Stephens and John R. Krebs, *Foraging Theory* (Princeton, NJ: Princeton University Press, 1986).
[2]See R. D. Horan and E. H. Bulte, and J. F. Shogren, "How Trade Saved Humanity from Biological Exclusion: An Economic Theory of Neanderthal Extinction," *Journal of Economic Behavior and Organization* (2005): 1–29.
[3]Adam Smith, *The Wealth of Nations* (New York: Random House, 1937), 13. Citations are to the Modern Library edition.

of microeconomics can help you to conceptualize the important economic decisions you must make in your life and that can often lead to better decision making. For example, Application 1.2: Is It Worth Your Time to Be Here? illustrates how notions of opportunity cost can clarify whether college attendance is really a good investment. Similarly, our discussion of home ownership in Chapter 7 should be of some help in deciding whether owning or renting is the better option.

Businesses also use the tools of microeconomics. Any firm must try to understand the nature of the demand for its product. A firm that stubbornly continues to produce a good or service that no one wants will soon find itself in bankruptcy. Application 1.3: The Rise and Fall of Blockbuster illustrates how one firm has had to constantly reorganize its methods of doing business in order to meet competition. As the example shows, some of the most elementary concepts from microeconomics can aid in understanding whether the changes worked and why the firm may ultimately disappear.

Firms must also be concerned with their costs; for this topic, too, microeconomics has found many applications. For example, in Chapter 7 we look at some of the research on airline company costs, focusing especially on why Southwest Airlines has been able to make such extensive inroads into U.S. markets. As anyone who has ever flown on this airline knows, the company's attention to keeping costs low verges on the pathological; though passengers may feel a bit like baggage, they certainly get to their destinations on time and usually at very attractive prices. Microeconomic tools can help to understand such efficiencies. They can also help to explore the implications of introducing these efficiencies into such notoriously high-cost markets as those for air travel within Europe.

Microeconomics is also often used to evaluate broad questions of government policy. At the deepest level, these investigations focus on whether certain laws and regulations contribute to or detract from overall welfare. For example, the 2008 financial crisis caused a major rethinking of how financial markets work and whether new forms of government regulation may be needed. As we see in later chapters, economists have devised a number of imaginative ways of addressing questions like this by modeling how such regulations may affect consumers, workers, and firms. These models often play crucial roles in the political debate surrounding the adoption or repeal of major policies. Later in this book, we look at many examples. Of course, there are usually two sides to most policy questions, and economists are no more immune than anyone else from the temptation to bend their arguments to fit a particular point of view. Knowledge of microeconomics provides a basic framework—that is, a common language—in which many such discussions are conducted, and it should help you to sort out good arguments from self-serving ones. In many of our applications we include a "Policy Challenge" that we hope will provide a succinct summary of the key economic issues that must be considered in making government decisions.

1-4 The Basic Supply-Demand Model

Supply-demand model
A model describing how a good's price is determined by the behavior of the individuals who buy the good and of the firms that sell it.

As the saying goes, "Even your pet parrot can learn economics—just teach it to say 'supply and demand' in answer to every question." Of course, there is often more to the story. But economists tend to insist that market behavior can usually be explained by the relationship between preferences for a good (demand) and the costs involved in producing that good (supply). The basic **supply-demand model** of price determination is a staple of all courses in introductory economics—in fact, this model may be the first thing you studied in your introductory course. Here we provide a quick review, adding a bit of historical perspective.

APPLICATION 1.2

Is It Worth Your Time to Be Here?

Those of you who are studying microeconomics as part of your college education are probably paying quite a bit to be in school. It is reasonable to ask whether this spending is somehow worth it. Of course, many of the benefits of college (such as the better appreciation of culture, and friendship) do not have monetary value. In this application, we ask whether the cost is worth it purely in dollar terms.

Measuring Costs Correctly

The typical U.S. college student pays about $22,000 per year for in-state tuition, fees, and room and board charges. So one might conclude that the "cost" of four years of college is about $88,000. But this would be incorrect for at least three reasons—all of which derive from a simple application of the opportunity cost idea:

- Inclusion of room and board fees overstates the true cost of college because most of these costs would likely be incurred whether you were in college or not.
- Including only out-of-pocket costs omits the most important opportunity cost of college attendance—foregone earnings you might make on a job.
- College costs are paid over time, so you cannot simply add 4 years of costs together to get the total.

The costs of college can be adjusted for these factors as follows. First, room and board costs amount to about $9,000 annually, so tuition and fees alone come to $13,000. To determine the opportunity cost of lost wages, we must make several assumptions, one of which is that you could earn about $20,000 per year if you were not in school and can make back only about $2,000 in odd jobs. Hence, the opportunity cost associated with lost wages is about $18,000 per year, raising the total annual cost to $31,000. For reasons to be discussed in Chapter 14, we cannot simply multiply $4 \cdot \$31{,}000$ but must allow for the fact that some of these dollar payments will be made in the future. In all, this adjustment would result in a total present cost figure of about $114,000.

The Earnings Gains to College

A number of recent studies have suggested that college graduates earn much more than those without such an education. A typical finding is that annual earnings for otherwise identical people are about 50 percent higher if one has attended college. Again, using our assumption of $20,000 in annual earnings for someone without a college education, this would imply that earnings gains from graduation might amount to $10,000 per year. Looked at as an investment, going to college yields about 9 percent per year (that is, $10/114 \approx 0.09$). This is a relatively attractive real return, exceeding that on long-term bonds (about 2 percent) and on stocks (about 7 percent). Hence, being here does seem worth your time.

Will the Payoffs Last?

These calculations are not especially surprising—most people know that college pays off. Indeed, college attendance in the United States has been expanding rapidly, presumably in response to such rosy statistics. What is surprising is that this large increase in college-educated people does not seem to have reduced the attractiveness of the investment, even in the weak labor markets that prevailed after the 2008–2009 recession. It must be the case that for some reason the demand for college-educated workers has managed to keep up with the supply. Possible reasons for this have been the subject of much investigation.[1] One likely explanation is that some jobs have become more complex over time. This process has been accelerated by the adoption of computer technology. Another explanation is that trade patterns in the United States may have benefited college-educated workers because they are employed disproportionately in export industries. Whatever the explanation, one effect of the increased demand for such workers has been a trend toward greater wage inequality in the United States and other countries (see Application 13.3).

POLICY CHALLENGE

The U.S. government offers loans and grants to many students so that they can attend college. Why are such loans necessary if college is such a good investment? Should the government provide larger loans to students who attend private schools where tuitions can be up to three times those charged for in-state students at public universities? From our calculations it seems that the return to attending a private college would be much smaller than from attending a public school because of these higher tuitions. Do you believe that actually is true? Should the promised rate of return determine how much the government will lend?

[1]For a discussion, see D. Acemoglu, "Technical Change, Inequality, and the Labor Market," *Journal of Economic Literature* (March 2002): 7–72.