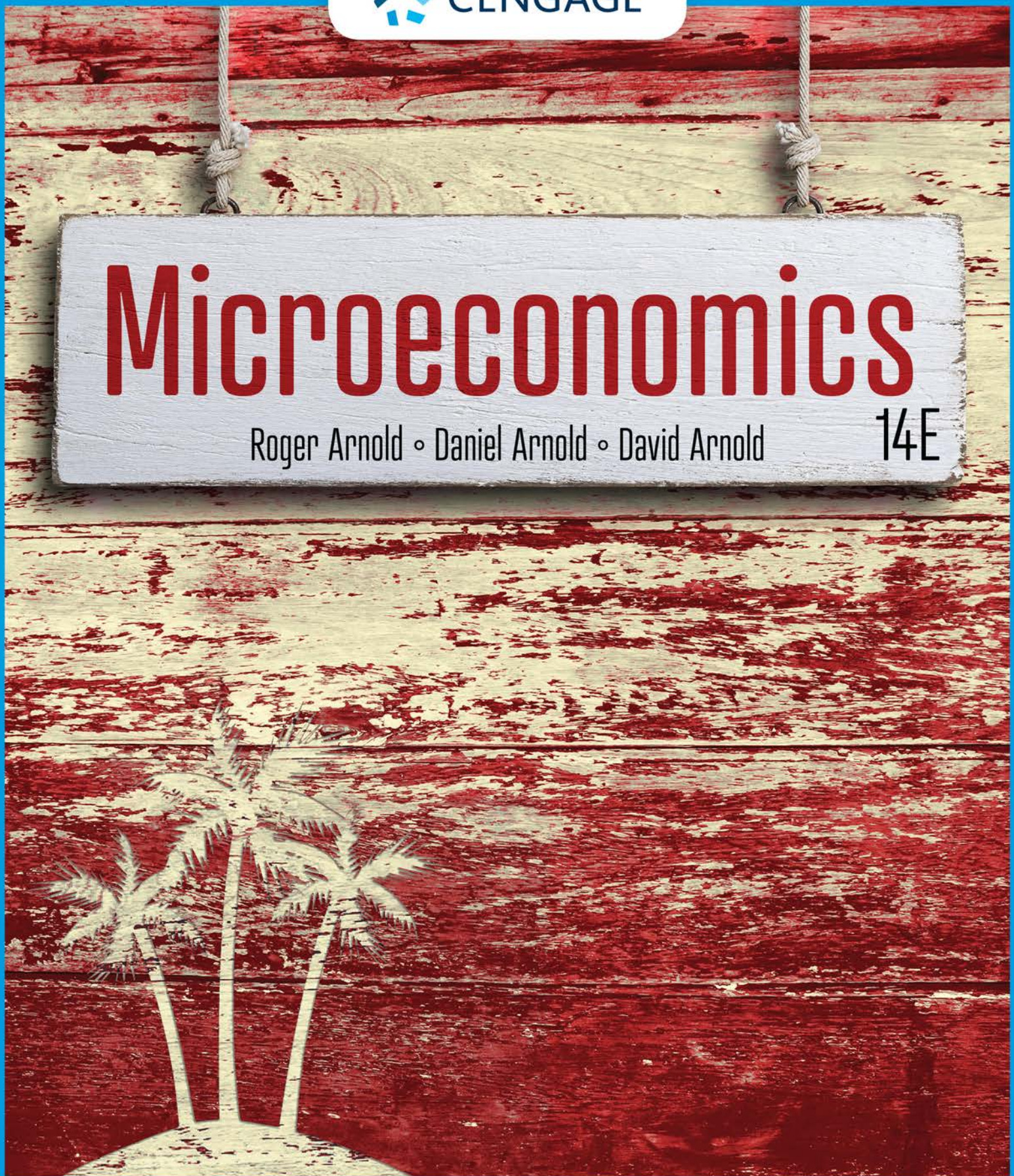
CENGAGE

Microeconomics

14E

Roger Arnold • Daniel Arnold • David Arnold



Dear Student,

Life is full of questions, both big and small. "What time is our final exam going to be on Thursday?" is a small question. But "What is the meaning of life?" is a big question.

Small questions often have obvious answers. But when it comes to the big questions, people ponder over them for hundreds of years and still have a hard time definitively answering them.

Most questions in life fall somewhere between the small and the big. They don't have obvious answers, but they still can be answered. However, in order to answer these questions, we need to proceed a certain way. Science is often that way. Sciences such as physics, chemistry, and biology seek to answer certain questions.

Economics is a science, too, and it exists to answer questions like these: Why are some nations rich and others poor? What determines the income you earn, the prices you pay, or whether you are employed or unemployed? Why are house prices higher in San Francisco than in Indianapolis? How do you go about deciding to buy another hamburger, or another shirt? Why do some people become lawyers and others become teachers, plumbers, or software engineers? Why does it cost $939 to rent a U-Haul to drive from Los Angeles to Phoenix but only $189 to go the other way, from Phoenix to Los Angeles? Why is medical care so expensive? What causes prices in general to rise or fall? Why is the inflation rate higher in some countries relative to other countries? What causes recessions? Why were interest rates high in the late seventies but are relatively low today?

Think of this book as a set of questions on one side of a river and a set of answers on the other side. The way we get from questions to answers is with economics. Its theories, concepts, and ways of thinking, as you will soon see, will build that bridge on which we will travel from questions to answers.

Before we leave you to get started learning economics, we want to tell you a little about the structure of this book. There are three major parts to it. First, there is the main content of the book—that includes the words and diagrams in each chapter. It's the "meat and potatoes" of the economics course.

Second, there are various boxed and stand-alone features in each chapter—such as *Economics 24/7*, *Thinking Like an Economist*, *Finding Economics*, and *Office Hours*. The features apply what has been learned in the "meat and potatoes" of the text. Learning to apply economics will enable you to use economics to answer your own questions.

Third, there are numerous instructional videos with this book—such as *Video Lectures*, *Economics in 5 Minutes*, *What's Wrong with This Diagram?* and more. These videos not only help you learn the main content of the book but also help you work with and fully understand the many diagrams in it.

As you proceed on your economics journey, keep in mind that it takes sustained effort—and some patience—to learn economics. As you will soon find out, the effort is well worth it. Best of luck to you as you begin your study of economics.

Best Wishes,

Roger A. Arnold • Daniel R. Arnold • David H. Arnold

Microeconomics

Microeconomics

Fourteenth Edition

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In memory of Craig Rader.
A staunch believer in and shining example
of the power of learning and education.

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Preface

This is the fourteenth edition of *Microeconomics*. In it you will find three new chapters—chapters that will be particularly relevant to economic students in the early-to-mid 2020s. They are:

- Creative Destruction and Crony Capitalism: Two Forces on the Economic Landscape Today
- Health Economics: Experiments, Disparities, and Prices
- New Frontiers in Economic Research: Causal Inference and Machine Learning

With these three new chapters, students will learn what creative destruction is and how it plays out in today's world, what crony capitalism is and why it exists, what various health economic experiments tell us about how and why people buy health care and health insurance, how economists conduct research, how they infer causality, and how big data and machine learning are being used to make policy decisions. Creative destruction, crony capitalism, health care, research, data, and machine learning—this is much of the world today, and it is important for students to have the information, analytic tools, and ways of thinking to understand it.

This edition keeps much of what adopters have liked about previous editions. The content remains straightforward and accessible and comes with numerous boxed applications. We believe that economics has a lot to say these days and we want that communication between text and student to be as crystal clear, unambiguous, and accessible as possible. But to enrich the basic economic content, there need to be applications. Students need to see the basic economic tools of analysis being used to explain things, and here is where the applications come in. A hallmark of this text over various editions is the plentiful and relevant applications it features. This edition has numerous boxed applications that can be found under these four main titles: *Economics 24/7*, *Thinking Like an Economist*, *Finding Economics*, and *Office Hours*. A few of the many new ones to this edition include:

- Movie Studios vs Netflix: Incentives Matter
- The Future: Looking at Automation and Jobs
- Is Labor Being Misallocated Across U.S. Cities?
- Google, Facebook, Monopoly, and Property Rights
- Covid-19 and Health Disparities
- The Covid-19 Pandemic and the PPF
- Stoic Philosophy, Search Engines, and Consumers' Surplus
- The Median Voter Model and the U.S. Supreme Court in 2018
- Netflix and Big Data
- The DOJ, FTC, Google, and Facebook
- Spurious Correlations
- Artificial Intelligence, Robotics, and the Future of Jobs

This edition carries forward the video content, first started in earlier editions. There are two sets of instructional videos—*Economics in 5 Minutes* and *Video Lectures*; *What's Wrong with This Diagram?* videos; and *Problem Walk-Through* videos. The different types of videos are all instructional and designed to complement the chapter text material.

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, written by Noreen Templin, Butler Community College, contains chapter summaries, chapter objectives, supplements, activities and assessments, and chapter outlines. It is available on the text website at http://www.cengage.com for instructors only.
- PowerPoint Slides, revised by Noreen Templin, Butler Community College, are available on the text website for use by instructors for enhancing their lectures. These fully accessible PowerPoint slides provide chapter-level presentations and highlight opportunities for increased peer-peer interactivity.
- A Test Bank, authored and revised for the fourteenth edition by Peggy Crane, Southwestern College, is delivered via Cognero, an online assessment system that supports the computerized Test Bank. Cognero allows instructors to create and assign tests, deliver tests through a secure online test center, and have the complete reporting and data dissemination at their fingertips.

In Appreciation

Many colleagues have contributed to the success of this text over the last thirteen editions. Their feedback continues to influence and enhance the text and ancillary package and we're grateful for their efforts. Now into our 14th edition, space dictates that we can no longer list the names of all reviewers for each past edition; we are including here instructors who contributed to the development of the 14th edition, but continue to be grateful for the improvements suggested by all of the reviewers and contributors to this product over the years.

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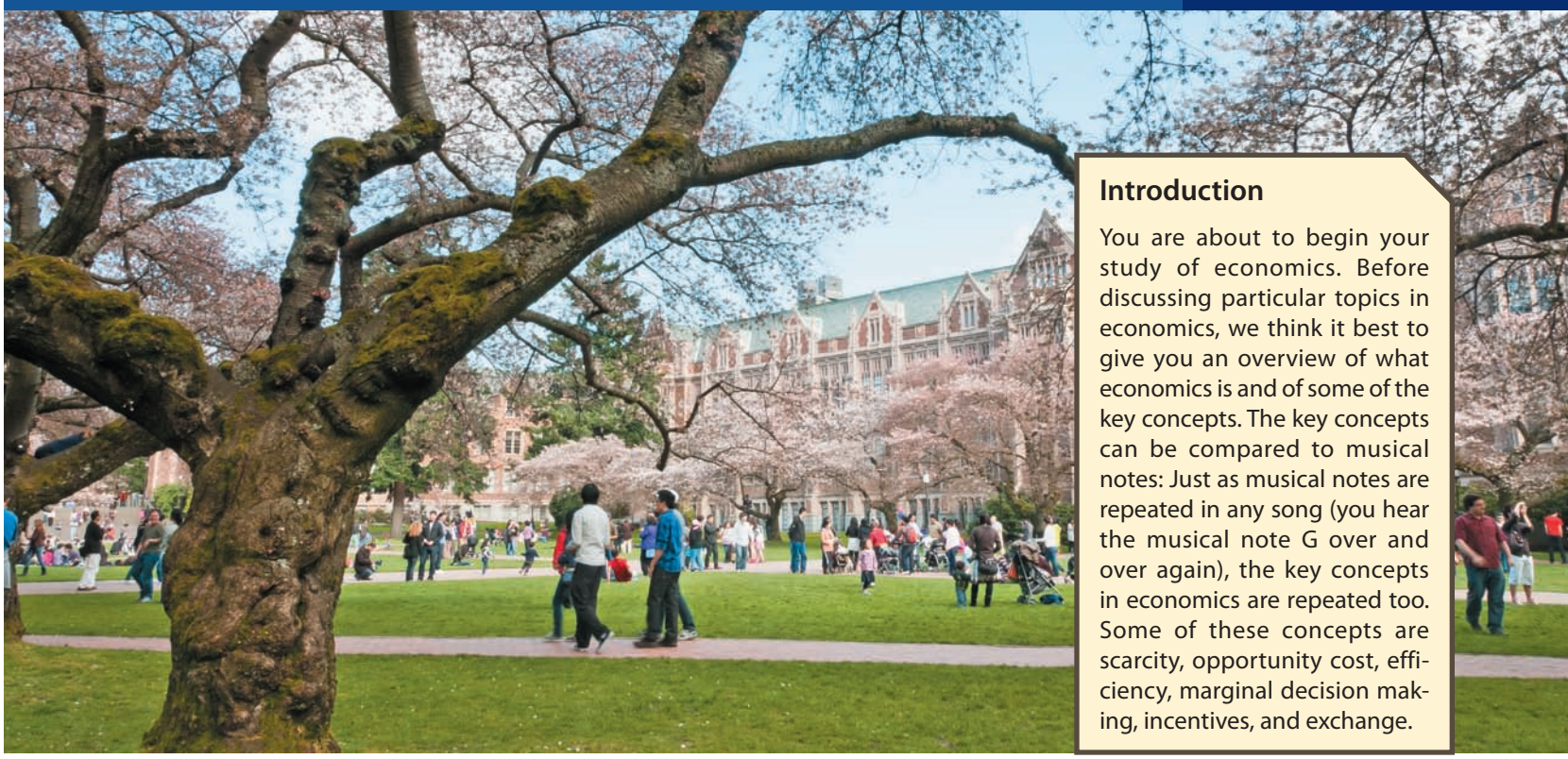
We are indebted to all the outstanding and creative people we worked with on the 14th edition. Chris Rader, product manager; Colleen Farmer, senior content manager; Shannon Aucoin, subject matter expert; Eugenia Belova, subject matter expert; Sarah Keeling, senior learning designer; John Carey, executive marketing manager; and Peggy Crane of Southwestern College; and Noreen Templin of Butler Community College. There are a host of activities that go on behind the scenes when producing a book. The authors' names are on the book's cover, but really it is a team of people who end up tending to the 1,001 details that make the book what it is. It is hard to imagine a better team of creative, conscientious, and dedicated publishing professionals to work with anywhere.

Roger A. Arnold Daniel R. Arnold David H. Arnold

CHAPTER 1

What Economics Is About



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Introduction

You are about to begin your study of economics. Before discussing particular topics in economics, we think it best to give you an overview of what economics is and of some of the key concepts. The key concepts can be compared to musical notes: Just as musical notes are repeated in any song (you hear the musical note G over and over again), the key concepts in economics are repeated too. Some of these concepts are scarcity, opportunity cost, efficiency, marginal decision making, incentives, and exchange.

1-1 Your Life, 2024–2034

What will your life be like during the years 2024–2034? What kind of work will you do after college? How much will you earn in that first job after college? Where will you be living, and who will be your friends? How many friends will you have? Will you buy a house in the next few years? If so, how much will you pay for the house? And, perhaps most importantly, will you be happy?

The specific answers to these questions and many more have to do with economics. For example, the salary you will earn has to do with the economic concept of *opportunity cost*. What you will do in your first job after college has to do with the *state of the economy* when you graduate. The price you pay for a house has to do with the state of the *housing market*. How many friends you have has to do with the economic concept of *scarcity*. Whether you are happy will depend on such things as the *net benefits* you receive in various activities, the *utility* you gain by doing certain things, and more.

In this chapter, we begin our study of economics. As you read the chapter (and those which follow), ask yourself how much of what you are reading is relevant to your life today and tomorrow. Ask: What does what I am reading have to do with *my* life? Our guess is that after answering this question a few dozen times, you will be convinced that economics explains much about your present and future.

1-2 A Definition of Economics

In this section, we discuss a few key economic concepts; then we incorporate knowledge of these concepts into a definition of economics.

1-2a Goods and Bads

Good
Anything from which individuals receive utility or satisfaction.

Utility
The satisfaction one receives from a good.

Bad
Anything from which individuals receive disutility or dissatisfaction.

Disutility
The dissatisfaction one receives from a bad.

Economists talk about *goods* and *bads.* A **good** is anything that gives a person **utility**, or satisfaction. Here is a partial list of some goods: a computer, a car, a watch, a television set, friendship, and love. You will notice from our list that a good can be either tangible or intangible. A computer is a tangible good; friendship is an intangible good. Simply put, for something to be a good (whether tangible or intangible), it only has to give someone utility or satisfaction.

A **bad** is something that gives a person **disutility** or dissatisfaction. If the flu gives you disutility or dissatisfaction, then it is a bad. If the constant nagging of an acquaintance is something that gives you disutility or dissatisfaction, then it is a bad.

People want goods, and they do not want bads. In fact, they will pay to get goods ("here is $1,000 for the computer"), and they will pay to get rid of bads ("I'd be willing to pay you, doctor, if you can prescribe something that will shorten the time I have the flu").

Can something be a *good* for one person and a *bad* for another person? Smoking cigarettes gives some people utility; it gives others disutility. We conclude that smoking cigarettes can be a *good* for some people and a *bad* for others. This must be why people tell their loved ones, "If you want to smoke, you should do it outside." In other words, "Get those *bads* away from me."

1-2b Resources

Land
All natural resources, such as minerals, forests, water, and unimproved land.

Labor
The work brought about by the physical and mental talents that people contribute to the production process.

Capital
Produced goods—such as factories, machinery, tools, computers, and buildings—that can be used as inputs for further production.

Entrepreneurship
The talent that some people have for organizing the resources of land, labor, and capital to produce goods, seek new business opportunities, and develop new ways of doing things.

Goods do not just appear before us when we snap our fingers. It takes resources to produce goods. (Sometimes *resources* are referred to as *inputs* or *factors of production.*)

Generally, economists divide resources into four broad categories: *land, labor, capital,* and *entrepreneurship.*

- **Land** includes natural resources, such as minerals, forests, water, and unimproved land. For example, oil, wood, and animals fall into this category. (Sometimes economists refer to the category simply as *natural resources.*)
- **Labor** consists of the physical and mental talents that people contribute to the production process. For example, a person building a house is using his or her own labor.
- **Capital** consists of produced goods that can be used as inputs for further production. Factories, machinery, tools, computers, and buildings are examples of capital. One country might have more capital than another; that is, it has more factories, machinery, tools, and the like.
- **Entrepreneurship** refers to the talent that some people have for organizing the resources of land, labor, and capital to produce goods, seek new business opportunities, and develop new ways of doing things.

1-2c Scarcity and a Definition of Economics

Scarcity
The condition in which our wants are greater than the limited resources available to satisfy those wants.

We are now ready to define a key concept in economics: *scarcity*. **Scarcity** is the condition in which our wants (for goods) are greater than the limited resources (land, labor, capital, and entrepreneurship) available to satisfy those wants. In other words, we want goods, but not enough resources are available to provide us with all the goods we want.

Look at it this way: Our wants (for goods) are infinite, but our resources (which we need to produce the goods) are finite. Scarcity is the result of our infinite wants hitting up against finite resources.

Many economists say that if scarcity didn't exist, neither would economics. In other words, if our wants weren't greater than the limited resources available to satisfy them, there would be no field of study called economics. This is similar to saying that if matter and motion didn't exist, neither would physics or that if living things didn't exist, neither would biology. For this reason, we define **economics** in this text as the science of scarcity. More completely, *economics is the science of how individuals and societies deal with the fact that wants are greater than the limited resources available to satisfy those wants*.

Economics
The science of scarcity; the science of how individuals and societies deal with the fact that wants are greater than the limited resources available to satisfy those wants.

Thinking Like an Economist

Scarcity Affects Everyone Everyone in the world—even a billionaire—has to face scarcity. Billionaires may be able to satisfy more of their wants for tangible goods (houses, cars) than most people, but they still may not have the resources to satisfy all their wants. Their wants might include more time with their children, more friendship, no disease in the world, peace, and a hundred other things that they don't have the resources to "produce."

Thinking in Terms of Scarcity's Effects

Scarcity has effects, such as the need to make choices, the need for a rationing device, and competition.

Choices People have to make choices because of scarcity. Because our unlimited wants are greater than our limited resources, some wants must go unsatisfied. We must choose which wants we will satisfy and which we will not. Mia asks, "Do I go to Hawaii or do I pay off my car loan earlier?" Alex asks, "Do I buy the new sweater or two new shirts?"

Need for a Rationing Device A **rationing device** is a means of deciding who gets what of available resources and goods. Scarcity implies the need for a rationing device. If people have infinite wants for goods and if only limited resources are available to produce the goods, then a rationing device is needed to decide who gets the available quantity of goods. Dollar price is a rationing device. For instance, 100 cars are on the lot, and everyone wants a new car. How do we decide who gets what quantity of the new cars? The answer is to use the rationing device called *dollar price*. The people who pay the dollar price for a new car end up with one.

Rationing Device
A means for deciding who gets what of available resources and goods.

Scarcity and Competition Do you see competition in the world? Are people competing for jobs? Are states and cities competing for businesses? Are students competing for grades? The answer to all these questions is yes. The economist wants to know why this competition exists and what form it takes. First, the economist concludes, competition exists because of scarcity. If there were enough resources to satisfy all our seemingly unlimited wants, people would not have to compete for the available, but limited, resources.

Second, the economist sees that competition takes the form of people trying to get more of the rationing device. If dollar price is the rationing device, people compete to earn dollars. Look at your own case. You are a college student working toward a degree. One reason (but perhaps not the only reason) you are attending college is to earn a higher income after graduation. But why do you want a higher income? You want it because it will allow you to satisfy more of your wants.

Suppose muscular strength (measured by lifting weights), instead of dollar price, were the rationing device. Then people with more muscular strength would receive more resources and goods than people with less muscular strength. In that case, people would compete for muscular strength. (They would spend more time at the gym lifting weights.) The lesson is simple: *Whatever the rationing device is, people will compete for it.*

Finding Economics

At the Campus Bookstore To learn economics well, you must practice what you learn. One of the ways to practice economics is to find it in everyday life. Consider the following scene: You are in the campus bookstore buying a book for your computer science course, and you are handing $85 to the cashier. Can you find the economics in this simple scene? Before you read on, think about it for a minute.

Let's work backward to find the economics. You are currently handing the cashier $85. We know that dollar price is a rationing device. But let's now ask ourselves why we would need a rationing device to get the book. The answer is scarcity. In other words, scarcity is casting its long shadow there in the bookstore as you buy a book. We have found one of the key economic concepts—scarcity—in the campus bookstore. (If you also said that a book is a good, then you have found even more economics in the bookstore. Can you find more than scarcity and a good?)

Self-Test

(Answers to Self-Test questions are in Answers to Self-Test Questions at the back of the book.)

1. True or false? Scarcity is the condition of finite resources. Explain your answer.
2. How does competition arise out of scarcity?
3. How does choice arise out of scarcity?

1-3 Key Concepts in Economics

A number of key concepts in economics define the field. We discuss a few of these concepts next.

1-3a Opportunity Cost

Opportunity Cost
The most highly valued opportunity or alternative forfeited when a choice is made.

So far, we have established that people must make choices because scarcity exists. In other words, because our seemingly unlimited wants push up against limited resources, some wants must go unsatisfied. We must therefore *choose* which wants we will satisfy and which we will not. The most highly valued opportunity or alternative forfeited when we make a choice is known as **opportunity cost**. Every time you make a choice, you incur an opportunity cost. For example, you have chosen to read this chapter. In making this choice, you denied yourself the benefits of doing something else. You could have watched television, sent text messages to a friend, taken a nap, eaten a few slices of pizza, read a novel, shopped for a new computer, and so on. Whatever you *would have chosen* to do is the opportunity cost of your reading this chapter. For instance, if you would have watched television instead of reading this chapter—if that was your next best alternative—then the opportunity cost of reading the chapter is watching television.

There Is No Such Thing as a Free Lunch Economists are fond of saying that "there is no such thing as a free lunch." This catchy phrase expresses the idea that opportunity costs are incurred whenever choices are made. Perhaps this is an obvious point, but consider how often people mistakenly assume that there *is* a free lunch. For example, some parents think that education is free, because they do not pay tuition for their children to attend public elementary school. That's a misconception. "Free" implies no sacrifice and no opportunities forfeited, but an elementary school education requires resources that could be used for other things.

Consider the people who speak about free medical care, free housing, free bridges ("there's no charge to cross it"), and free parks. Again, free medical care, free housing, free bridges, and free parks are misconceptions. The resources that have been used to provide medical care, housing, bridges, and parks could have been used in other ways.

Economics 24/7

Rationing Spots at Yale

Each year, Yale University receives more applications for admission to the freshman class than spots are available. In most years, for every 100 applications for admission that Yale receives, it can accept only seven applicants for admission. What Yale has to do, then, is ration its available admission spots.

ISTOCKPHOTO/PETERSPIRO

How does it ration its available spots? One way is simply to use money as a rationing device. In other words, raise the dollar amount of attending Yale to a high enough level so that the number of spots equals the number of students willing and available to pay for admission. To illustrate, think of Yale as auctioning off spots in its freshman class. It calls out a price of $50,000 a year, and at this price, more people wish to be admitted to Yale than there are spots available. Yale keeps on raising the price until the number of students who are willing and able to pay the tuition is equal to the number of available spots. Maybe this price is, say, $200,000.

As we know, Yale does not ration its available spots this way. In fact, it uses numerous rationing devices in an attempt to whittle down the number of applicants to the number of available spots. For example, it might use the rationing device of high school grades. Anyone with a GPA in high school of less than, say, 3.50 is not going to be admitted. If, after doing this, Yale still has too many applicants, it might then make use of the rationing device of standardized test scores. Anyone with an SAT score of less than, say, 1300 is eliminated from the pool of applicants. If there are still too many applicants, then perhaps other rationing devices will be used, such as academic achievements, community service, degree of interest in attending Yale, and so on.

Yale might also decide that it wants to admit certain students over others, even if the two categories of students have the same academic credentials. For example, suppose Yale wants at least one student from each state in the country, and only 10 students from Wyoming have applied to go to Yale whereas 500 students from California have applied. Then Yale could very well use the rationing device of state diversity to decide in favor of the student from Wyoming instead of the applicant from California.

In the first week of April each year, Yale sends out many more rejection letters than acceptance letters. There is no doubt some students who are rejected by Yale feel that some of the students who were accepted might not be as academically strong as they are. The student with a 4.00 GPA and a perfect SAT score of 1600 may feel he was slighted by Yale when he learns that a student in his high school with a 3.86 GPA and SAT score of 1350 was chosen over him. What did the 3.86–1350 student have that he didn't have? On what rationing device benchmark did the rejected student score lower?

In life, you will often hear people arguing over what the rationing device for certain things should be. Should high school grades and standardized test scores be the only two rationing devices for college admission? What role should money play as a rationing device when a high school graduate applies to college? What role should ethnic or racial diversity, or state diversity, or income diversity play in the application process? Our point is a simple one: With scarcity comes the need for a rationing device. More people want a spot at Yale than there are spots available. Yale has to use one or more rationing devices to decide who will be accepted and who will be rejected.

Thinking Like an Economist

Zero Price Doesn't Mean Zero Cost A friend gives you a ticket to an upcoming concert for zero price (i.e., you pay nothing). Does it follow that zero price means zero cost? No. There is still an opportunity cost of attending the concert. Whatever you would be doing if you don't go to the concert is the opportunity cost of attending. To illustrate, if you don't attend the concert, you would hang out with friends. The value you place on hanging out with friends is the opportunity cost of your attending the concert.

1-3b Opportunity Cost and Behavior

Economists believe that a change in opportunity cost can change a person's behavior. For example, Darnell, who is a sophomore at college, attends classes Monday through Thursday of every week. Every time he chooses to go to class, he gives up the opportunity to do something else, such as earn $15 an hour working at a job. The opportunity cost of Darnell's spending an hour in class is $15.

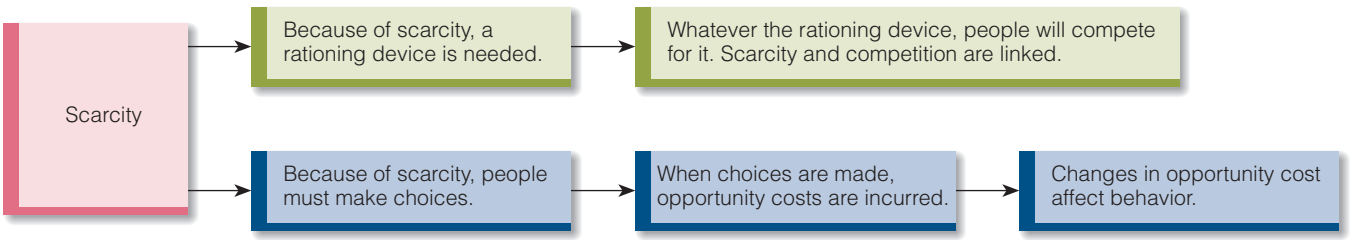
Now let's raise the opportunity cost of attending class. On Tuesday, we offer Darnell $70 to skip his economics class. He knows that if he attends his economics class, he will forfeit $70. What will Darnell do? An economist would predict that as the opportunity cost of attending class increases relative to the benefits of attending, Darnell is less likely to go to class.

This is how economists think about behavior: *The higher the opportunity cost of doing something, the less likely it is that it will be done.* This is part of the economic way of thinking.

Look at Exhibit 1, which summarizes some of the things about scarcity, choice, and opportunity cost up to this point.

EXHIBIT 1

Scarcity and Related Concepts



Finding Economics

In Being Late to Class Jordan is often a few minutes late to his biology class. The class starts at 10 a.m., but Jordan usually walks into the class at 10:03 a.m. The instructor has asked Jordan to be on time, but Jordan usually excuses his behavior by saying that the traffic getting to college was bad or that his alarm didn't go off at the right time or that something else happened to delay him. One thing the instructor observes, though, is that Jordan is never late when it comes to test day. He is usually in class a few minutes before the test begins. Where is the economics?

We would expect behavior to change as opportunity cost changes. When a test is being given in class, the opportunity cost of being late to class is higher than when a test is not being given and the instructor is simply lecturing. If Jordan is late to class on test day, he then has fewer minutes to complete the test, and having less time can adversely affect his grade. In short, the higher the opportunity cost of being late to class, the less likely it is that Jordan will be late.

1-3c Benefits and Costs

If we could eliminate air pollution completely, should we do it? If your answer is yes, then you are probably focusing on the *benefits* of eliminating air pollution. For example, one benefit might be healthier individuals. Certainly, individuals who do not breathe polluted air have fewer lung disorders than people who do breathe polluted air.

But benefits rarely come without costs. The economist reminds us that, although eliminating pollution has its benefits, it has costs too. To illustrate, one way to eliminate all car pollution tomorrow is to pass a law stating that anyone caught driving a car will go to prison for 40 years. With such a draconian law in place and enforced, very few people would drive cars and all car pollution would be a thing of the past. Presto! Cleaner air! However, many people would think that the cost of obtaining that cleaner air is too high. Someone might say, "I want cleaner air, but not if I have to completely give up driving my car. How will I get to work?"

What distinguishes the economist from the noneconomist is that the economist thinks in terms of *both* costs *and* benefits. Often, the noneconomist thinks in terms of one or the other. Studying has its benefits, but it has costs too. Coming to class has benefits, but it has costs too. Getting up early each morning and exercising has its costs, but let's not forget that there are benefits too.

1-3d Decisions Made at the Margin

It is late at night, and you have already spent three hours studying for tomorrow's biology test. You look at the clock and wonder if you should study another hour. How would you summarize your thinking process? What question or questions would you ask yourself to decide whether to study another hour?

Perhaps without knowing it, you think in terms of the costs and benefits of further study. You probably realize that studying an additional hour has certain benefits (you may be able to raise your grade a few points), but it has costs too (you will get less sleep or have less time to watch television or talk on the phone with a friend). *That* you think in terms of costs and benefits, however, doesn't tell us *how* you think in terms of costs and benefits. For example, when deciding what to do, do you look at the *total costs* and *total benefits* of the proposed action, or do you look at something less than the total costs and benefits? According to economists, for most decisions, you think in terms of *additional,* or *marginal,* costs and benefits, not *total* costs and benefits. That's because most decisions deal with making a small, or additional, change.

To illustrate, suppose you just finished eating a hamburger and drinking a soda for lunch. You are still a little hungry and are considering whether to order another hamburger. An economist would say that, in deciding whether to order another hamburger, you compare the additional benefits of the second hamburger with its additional costs. In economics, the word *marginal* is a synonym for *additional.* So, we say that you compare the **marginal benefits (*MB*)** of the (next) hamburger to its **marginal costs (*MC*)**. If the marginal benefits are greater than the marginal costs, you obviously expect a net benefit of ordering the next hamburger, and

Marginal Benefits (*MB*)
Additional benefits; the benefits connected with consuming an additional unit of a good or undertaking one more unit of an activity.

Marginal Costs (*MC*)
Additional costs; the costs connected with consuming an additional unit of a good or undertaking one more unit of an activity.

therefore, you order another. If, however, the marginal benefits are less than the marginal costs, you obviously expect a net cost of ordering the next hamburger, and therefore, you do not order another. Logically, the situation is as follows:

Condition	Action
MB of next hamburger > *MC* of next hamburger	Buy next hamburger
MB of next hamburger < *MC* of next hamburger	Do not buy next hamburger

Decisions at the Margin
Decision making characterized by weighing the additional (marginal) benefits of a change against the additional (marginal) costs of a change with respect to current conditions.

What you don't consider when making this decision are the *total* benefits and *total* costs of hamburgers. That's because the benefits and costs connected with the first hamburger (the one you have already eaten) are no longer relevant to the current decision. You are not deciding between eating two hamburgers or eating no hamburgers; your decision is whether to eat a second hamburger after you have already eaten one.

According to economists, when individuals make decisions by comparing marginal benefits with marginal costs, they are making **decisions at the margin**. The employee makes a decision at the margin in deciding whether to work two hours overtime; the economics professor makes a decision at the margin in deciding whether to put an additional question on the final exam.

Economics 24/7

When Is It Too Costly to Attend College?

Look around your class. Are there any big-name actors, sports stars, or comedians between the ages of 18 and 25 in your class? Probably not. The reason is that, for these people, the opportunity cost of attending college is much higher than it is for most 18-to-25-year-olds. Think of Chris Rock, a comedian, and Emma Stone and Ryan Gosling, both actors. These people and many more like them chose not to go to college. Why didn't they go? The fact is that they didn't go to college because it was too expensive for them to go to college. Not "too expensive" in the sense that the "tuition was too high," but expensive in terms of what they would have had to give up if they attended college—expensive in opportunity cost terms.

To understand this idea, think of what it's costing you to attend college. If you pay $7,000 tuition a semester for eight semesters, the full tuition amounts to $56,000. However, $56,000 is not the full cost of attending college, because if you were not a student, you could be earning income working at a job. For example, you could be working at a full-time job earning $42,000 annually. Certainly, this $42,000, or at least part of it if you are currently working part time,

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is forfeited because you are attending college. It is part of the total cost of your attending college.

The *tuition cost* may be the same for everyone who attends your college, but the *opportunity cost* is not. Some

people have higher opportunity costs of attending college than others. It just so happens that Chris Rock, Emma Stone, and Ryan Gosling had extremely high opportunity costs of attending college. Each would have to give up hundreds of thousands of dollars if he or she were to attend college on a full-time basis.

Simply put, our story illustrates two related points we have made in this chapter. First, earlier we said that *the higher the opportunity cost of doing something, the less likely it will be done*. The opportunity cost of attending college is higher for some people than others, and that is why not everyone who can pay for college chooses to attend college.

Second, we said that economists believe that *individuals think and act in terms of costs and benefits and that they undertake actions only if they expect the benefits to outweigh the costs*. Thus, Chris Rock, Emma Stone, and Ryan Gosling saw certain benefits to attending college—just as you see certain benefits to attending college. But those benefits—although they may be the same for you and everyone else—are not enough to get everyone to attend college. That's because the benefits are not all that matters. The costs matter too. In the case of Chris Rock, Emma Stone, and Ryan Gosling, the costs of attending college were much higher than the benefits, so they chose not to attend college. In your case, the benefits are higher than the costs, so you have decided to attend college.

1-3e Efficiency

What is the right amount of time to study for a test? In economics, the *right amount* of anything is the *optimal* or *efficient* amount—the amount for which the marginal benefits equal the marginal costs. Stated differently, you have achieved **efficiency** when the marginal benefits equal the marginal costs.

Efficiency
Exists when marginal benefits equal marginal costs.

Suppose you are studying for an economics test, and for the first hour of studying, the marginal benefits (*MB*) are greater than the marginal costs (*MC*):

$$MB \text{ studying first hour} > MC \text{ studying first hour}$$

Given this condition, you will certainly study for the first hour, because it is worth it: The additional benefits are greater than the additional costs, so there is a net benefit to studying.

Suppose, for the second hour of studying, the marginal benefits are still greater than the marginal costs:

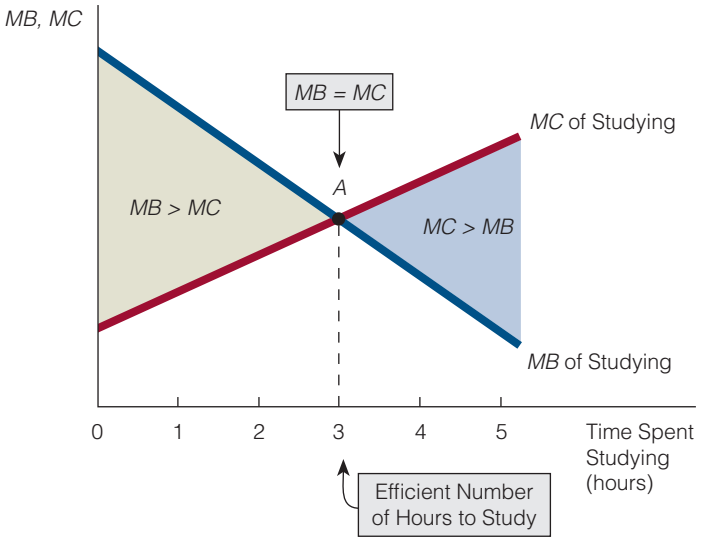
$$MB \text{ studying second hour} > MC \text{ studying second hour}$$

Then you will study for the second hour, because the additional benefits are still greater than the additional costs. In other words, studying the second hour is worthwhile. In fact, you will continue to study as long as the marginal benefits are greater than the marginal costs. Exhibit 2 illustrates this discussion graphically.

The *MB* curve of studying is downward sloping because we have assumed that the benefits of studying for the first hour are greater than the benefits of studying for the second hour and so on. The *MC* curve of studying is upward sloping because we have assumed that studying the second hour costs a person more (in terms of goods forfeited) than studying the first hour, studying the third hour costs more than studying the second, and so on. (If we assume that the additional costs of studying are constant over time, the *MC* curve is horizontal.)

In the exhibit, the marginal benefits of studying equal the marginal costs of studying at three hours. So, three hours is the *efficient* length of time to study in this situation. At less than three hours, the marginal benefits of studying are greater than the marginal costs; thus, at all these hours, studying has net benefits. At more than three hours, the marginal costs of studying are greater than the marginal benefits, so studying beyond three hours is not worthwhile.

EXHIBIT 2



Efficiency

MB = marginal benefits and *MC* = marginal costs. In the exhibit, the *MB* curve of studying is downward sloping, and the *MC* curve of studying is upward sloping. As long as *MB* > *MC*, the person will study. The person stops studying when *MB* = *MC*. This point is where efficiency is achieved.

Maximizing Net Benefits Take another look at Exhibit 2. Suppose you had stopped studying after the first hour (or, equivalently, after the 60th minute). Would you have given up anything? Yes, you would have given up the *net benefits* of studying longer. To illustrate, notice that between the first and the second hour, the *MB* curve lies above the *MC* curve. This means that studying the second hour has net benefits. But if you hadn't studied that second hour—if you had stopped after the first hour—then you would have given up the opportunity to collect those net benefits. The same analysis holds for the third hour. We conclude that by studying three hours (but not one minute longer), you have maximized net benefits. In short, efficiency, which is consistent with $MB = MC$, is also consistent with maximizing net benefits.

Thinking Like an Economist

No $10 Bills on the Sidewalk An economist says that people try to maximize their net benefits. You ask for proof. The economist says, "You don't find any $10 bills on the sidewalk." What is the economist getting at by making this statement? Keep in mind that you don't find any $10 bills on the sidewalk because, if there were a $10 bill on the sidewalk, the first person to see it would pick it up; when you came along, it wouldn't be there. But why would the first person to find the $10 bill pick it up? The reason is that people don't pass by net benefits, and picking up the $10 bill comes with net benefits. The *benefits* of having an additional $10 are obvious; the *costs* of obtaining the additional $10 bill are simply what you give up during the time you are stooping down to pick it up. In short, the marginal benefits are likely to be greater than the marginal costs (giving us net benefits), and that is why the $10 bill is picked up. Saying that there are no $10 bills on the sidewalk is the same as saying that no one leaves net benefits on the sidewalk. In other words, people try to maximize net benefits.

1-3f Economics Is About Incentives

An **incentive** is something that encourages or motivates a person to undertake an action.

Incentive
Something that encourages or motivates a person to undertake an action.

Often, what motivates a person to undertake an action is the belief that, by taking that action, she can make herself better off. For example, if we say that Piper has an incentive to study for the upcoming exam, we imply that, by studying, Piper can make herself better off, probably in terms of receiving a higher grade on the exam than if she didn't study.

Incentives are closely related to benefits and costs. Individuals have an incentive to undertake actions for which the benefits are greater than the costs or, stated differently, for which they expect to receive net benefits (benefits greater than costs).

Economists are interested in what motivates behavior. Why do people buy more of good *X* when its price falls? Why might people work longer hours when income tax rates decline? Why might people buy more of a particular good today if they expect the price of that good to go up next week? The general answer to many of these questions is that people do what they have an incentive to do. Economists then hunt for what the incentive is. For example, if people buy more of good *X* when its price goes down, what specifically is the incentive? How, specifically, do people make themselves better off by buying a good when its price declines. Do they get more utility or satisfaction? Or how do people make themselves better off if they buy a good today that they expect will go up in price next week?

Economics 24/7

Movie Studios Versus Netflix: Incentives Matter

MOSSAAB SHURAIH/SHUTTERSTOCK.COM

You go to a movie theater to see a movie, which is produced by, say, Universal Pictures. Is the movie theater in which you see the movie owned by Universal Pictures? Not these days. But this wasn't always the case. Back in the 1930s and 1940s, in what was considered the golden age of the movie business, movie studios owned their own movie theaters. But in 1948, based on an antitrust case brought by the U.S. Department of Justice, the Supreme Court ruled that movie studios could no longer own their own movie theaters.

Today, you might pay a $9–$15 ticket price to view a movie in a theater. The movie studio that made the movie and the theater owners share the revenue from that ticket price; it is not uncommon for the studio to earn around 60 percent of the ticket price and for the theater to earn 40 percent of it. But what is interesting is that the split between the studio and theater is not always the same in any given week of the movie's release. For example, the studio commonly gets a larger percentage of the first weekend's ticket gross, such as 90 percent. Then, in the second week, it might get 80 percent. At some point, the percentage turns in the favor of the theater in the later weeks of a movie's release.

Keep in mind that audiences are often the largest in the early weeks of a movie's release, so it makes financial sense for a movie

studio to want its percentage of the split between it and the theaters to be the largest when audiences are the largest (and, in this case, when the ticket revenues are the largest).

Because the studio–theater split is largest for the studio in the early weeks of a movie's release, the studio now has an incentive to get as much ticket revenue for the movie as possible to be pushed up as close to the release date of the movie. To illustrate, if a movie runs for four weeks, and the studio has its most favorable split of 90/10 in the first week only, then it would be most beneficial for the studio if all the ticket revenue for the movie could be earned in the first week instead of being spread over four weeks. For example, it is better for the studio to earn 90 percent of a total ticket revenue of $100 million (which is $90 million) in the first week than to earn, say, 90 percent of $40 million (which is $36 million) in the first week, 80 percent of $30 million (which is $24 million) in the second week, 20 percent of $20 million (which is $4 million) in the third week, and 10 percent of $10 million (which is $1 million) in the fourth week. In other words, it is better to earn $90 million out of $100 million than to earn $65 million out of $100 million.

Given this, movie studios have an incentive to make movies that make a big initial bang at the box office. It is better to make a movie that comes out with a big bang and fizzles out later than to make a movie that starts slow and grows over time—so if there is a bang, it needs to come early. This incentivizes studios to make movies with a built-in demand—such as movies based on best-selling books or superhero, or event movies. An event movie is a movie whose release itself is considered a major event; it could be an anticipated sequel (almost all *Star Wars* movies were anticipated sequels or prequels), a big-budget movie with major stars, or a movie with state-of-the-art effects. That is to say, the types of movies that studios often make are related to the way they split the ticket revenue with theaters. In short, incentives matter. In this case, incentives influence what kinds of movies are most likely to get made by the studios.

Think about this. In recent years, Netflix has begun to produce some of its own content. Some of its content includes original series and movies. Netflix earns most of its revenue from subscription fees; there is no split, like what a movie studio has with a theater. Netflix, then, is much more inclined than a major movie studio to produce a movie or original series that it believes will grow *in time*, due to word of mouth. It is not as inclined to go for the big bang up front, close to the release date, like what a movie theater would do. For Netflix, the first week of an original movie's release is not as important as it is to a movie studio that is concerned with a declining split of the ticket revenue as weeks progress. The first week and the fourth week and the 10th week can all bring in new Netflix subscribers.

1-3g Unintended Effects

Economists think in terms of unintended effects. For instance, Andrés, 16 years old, currently works after school at a grocery store. He earns $9.50 an hour.

Suppose the state legislature passes a law specifying that the minimum dollar wage a person can be paid to do a job is $15 an hour. The legislators' intention in passing the law is to help people like Andrés earn more income.

Will the $15-an-hour legislation have the intended effect? Perhaps not. The manager of the grocery store may not find it worthwhile to continue employing Andrés if she has to pay him $15 an hour. In other words, Andrés may have a job at $9.50 an hour but not at $15 an hour. If the law specifies that no one may earn less than $15 an hour and the manager of the grocery store decides to fire Andrés rather than pay that amount, then an unintended effect of the legislation is Andrés losing his job.

As another example, let's analyze mandatory seat-belt laws to see whether they have any unintended effects. States have laws that require drivers to wear seat belts. The intended effect is to reduce the number of car-related fatalities by making it more likely that drivers will survive accidents.

Could these laws have an unintended effect? Some economists think so. They look at accident fatalities in terms of this equation:

$$\text{Total number of fatalities} = \text{Number of accidents} \times \text{Fatalities per accident}$$

For example, if there are 200,000 accidents and 0.10 fatality per accident, the total number of fatalities is 20,000.

The objective of a mandatory seat-belt program is to reduce the total number of fatalities by reducing the number of fatalities per accident (the fatality rate). Many studies have found that wearing seat belts does just that. If you are in an accident, you have a better chance of not being killed if you are wearing a seat belt.

Let's assume that, with seat belts, there is 0.08, instead of 0.10, fatality per accident. If there are still 200,000 accidents, then the total number of fatalities falls from 20,000 to 16,000. Thus, as the following table shows, the total number of fatalities drops if the number of fatalities per accident is reduced and the number of accidents is constant:

Number of Accidents	Fatalities per Accident	Total Number of Fatalities
200,000	0.10	20,000
200,000	0.08	16,000

However, some economists wonder whether the number of accidents stays constant. Specifically, they suggest that seat belts may have an unintended effect: *The number of accidents may increase* because wearing seat belts may make drivers feel safer. Feeling safer may cause them to take chances that they wouldn't ordinarily take, such as driving faster or more aggressively, or concentrating less on their driving and more on the music on the radio. For example, if the number of accidents rises to 250,000, then the total number of fatalities is again 20,000:

Number of Accidents	Fatalities per Accident	Total Number of Fatalities
200,000	0.10	20,000
250,000	0.08	20,000

We conclude the following: If a mandatory seat-belt law reduces the number of fatalities per accident (the intended effect) but increases the number of accidents (an unintended effect), then the law may not, contrary to popular belief, reduce the total number of fatalities. In fact, some economics studies show just that.

What does all this mean for you? You may be safer if you know that this unintended effect exists and you adjust accordingly. To be specific, when you wear your seat belt, your chances of getting hurt in a car accident are less than if you don't wear your seat belt. But if this added sense of protection causes you to drive less carefully than you would otherwise, then you could unintentionally offset the measure of protection your seat belt provides. To reduce the probability of hurting yourself and others in a car accident, *the best policy is to wear a seat belt and to drive as carefully as you would if you weren't wearing a seat belt.* Knowing about the unintended effect of wearing your seat belt could save your life.

1-3h Exchange

Exchange, or **trade**, is the giving up of one thing for something else. Economics is sometimes called the *science of exchange* because so much that is discussed in economics has to do with exchange.

Exchange (Trade)
The giving up of one thing for something else.

We start with a basic question: Why do people enter into exchanges? The answer is that they do so to make themselves better off. When a person voluntarily trades $100 for a jacket,

she is saying, "I prefer to have the jacket instead of the $100." And, of course, when the seller of the jacket voluntarily sells the jacket for $100, he is saying, "I prefer to have the $100 instead of the jacket." In short, through trade or exchange, each person gives up something he values less for something he values more.

You can think of trade in terms of utility or satisfaction. Imagine a utility scale that goes from 1 to 10, with 10 being the highest utility you can achieve. Now, suppose you currently have $40 in your wallet and you are at 7 on the utility scale. A few minutes later, you are in a store looking at some new shirts. The price of each is $20, and you end up buying two shirts for $40.

After you traded your $40 for the shirts, are you still at 7 on the utility scale? The likely answer is no. If you expected to have the same utility after the trade as you did before, you probably would not have traded your $40 for the shirts. The only reason you entered into the trade is that you *expected* to be better off after the trade than you were before it. In other words, you thought that trading your $40 for the shirts would move you up the utility scale from 7 to, say, 8.

Economics 24/7

Why Didn't I Think of That? The Case of Uber and Airbnb

SVETIKD/E+/GETTY IMAGES

Consider two companies, both headquartered in San Francisco. The first is Uber and the second is Airbnb. Uber is a company that operates a mobile-app-based transportation network. Here are how things work. One person needs transportation from home to the airport. Another person, with a car, who is in the vicinity of this first person, is willing and able to drive the person to the airport for a fee. Uber takes a percentage of the dollar transaction between driver and rider. In a way, you could say that Uber is a taxi company but owns no taxis.

Now consider Airbnb, which is essentially a website. Here are how things work at the website. One person wants to rent a room in a house, or an entire house, or, say, a couch in the living room of someone's house for a night, a week, or more. Another person, with a room or a house or a couch in the living room, is willing to accommodate this person. What Airbnb essentially does is put these two people in contact with each other and charge a fee. In a way, you could say that Airbnb is a hotel but owns no rooms.

Now what many people think when first learning about Uber and Airbnb is to ask themselves: Why didn't I think of that? How ingenious to start your own taxi business but not own any taxis, or to start your own hotel businesses but not own any rooms.

Now what must the founders of Uber and Airbnb have been thinking that others didn't? Whether they knew it or not, what they were thinking about was exchange or trade. As we stated earlier, exchange or trade is giving up one thing for something else. In the case of Uber, one person is giving up money for a ride to the airport. The other person is giving up time and a car to drive the first person to the airport for money. In the case of Airbnb, one person is giving up money for a week's stay in a house. The other person is giving up occupancy of the house for money.

Now what Uber and Airbnb essentially do is bring people together who want to trade with each other. Uber knows that there are people who want to be transported from one location to another and other people who want to do the transporting. Uber brings these two sets of people together. Airbnb knows that there are people who want to rent a room or a house in, say, Miami Beach for a day or a week and other people who want to rent out their room or a house in Miami for a day or a week. Airbnb brings these two sets of people together.

So, how does one come up with the Uber or Airbnb ideas? Basically, both ideas have to do with trying to answer this question: *How do I bring together people who want to trade with each other but who are not currently trading with each other?* That is the question the founders of both Uber and Airbnb asked and answered, albeit the first with respect to transportation and the second with respect to lodging. Are there other instances where people who want to trade with each other are just waiting to be brought together?

Self-Test

1. Give an example to illustrate how a change in opportunity cost can affect behavior.
2. Studying has both costs and benefits. If you continue to study (e.g., for a test) for as long as the marginal benefits of studying are greater than the marginal costs, and you stop studying when the two are equal, will your action be consistent with having maximized the net benefits of studying? Explain your answer.
3. You stay up an additional hour to study for a test. The intended effect is to raise your test grade. What might be an unintended effect of staying up another hour to study?

1-4 *Ceteris Paribus* and Theory

We cover two important topics in this section: (1) *ceteris paribus* and (2) theory.

1-4a *Ceteris Paribus* Thinking

Dylan has eaten regular ice cream for years, and for years, his weight has been 190 pounds. One day, Dylan decides he wants to lose weight. With this objective in mind, he buys a new fat-free ice cream at the grocery store. The fat-free ice cream has half the calories of regular ice cream.

Dylan eats the fat-free ice cream for the next few months. He then weighs himself and finds that he has gained two pounds. Does this mean that fat-free ice cream causes people to gain weight and regular ice cream does not? The answer is no. Why did Dylan gain weight when he substituted fat-free ice cream for regular ice cream? Perhaps Dylan ate three times as much fat-free ice cream as regular ice cream. Or perhaps during the time he was eating fat-free ice cream, he wasn't exercising, and during the time he was eating regular ice cream, he was exercising. In other words, a number of factors—such as eating more ice cream or exercising less—may have offset the weight loss that Dylan would have experienced had these other factors not changed.

Now, suppose you want to make the point that Dylan would have lost weight by substituting fat-free ice cream for regular ice cream had these other factors not changed. What would you say? A scientist would say, "If Dylan has been eating regular ice cream and his weight has stabilized at 190 pounds, then substituting fat-free ice cream for regular ice cream will lead to a decline in weight, *ceteris paribus*."

The term **ceteris paribus** means *all other things constant* or *nothing else changes*. In our ice cream example, if nothing else changes—such as how much ice cream Dylan eats, how much exercise he gets, and so on—then switching to fat-free ice cream will result in weight loss. This expectation is based on the theory that a reduction in calorie consumption will result in weight loss and an increase in calorie consumption will result in weight gain.

Ceteris Paribus
A Latin term meaning *all other things constant* or *nothing else changes*.

Using the *ceteris paribus* assumption is important because, with it, we can clearly designate what we believe is the correct relationship between two variables. In the ice cream example, we can designate the correct relationship between calorie intake and weight gain.

Economists don't often talk about ice cream, but they will often make use of the *ceteris paribus* assumption. An economist might say, "If the price of a good decreases, the quantity of it consumed increases, *ceteris paribus.*" For example, if the price of Pepsi decreases, people will buy more of it, assuming that nothing else changes.

But some people ask, "Why would economists want to assume that when the price of Pepsi falls, nothing else changes? Don't other things change in the real world? Why make assumptions that we know are not true?"

Of course, economists do not specify *ceteris paribus* because they want to say something false about the world. They specify it because they want to clearly define what they believe to be the real-world relationship between two variables. Look at it this way: If you drop a ball off the roof of a house, it will fall to the ground, unless someone catches it. This statement is true, and probably everyone would willingly accept it as true. But here is another true statement: If you drop a ball off the roof of a house, it will fall to the ground, *ceteris paribus.* In fact, the two statements are identical in meaning. This is because adding the phrase "unless someone catches it" in the first sentence is the same as saying "*ceteris paribus*" in the second sentence. If one statement is acceptable to us, the other should be too.

1-4b What Is a Theory?

Almost everyone, including you, builds and tests theories or models on a regular basis. (In this text, the words *theory* and *model* are used interchangeably.) Perhaps you thought that only scientists and others with high-level mathematics at their fingertips built and tested theories. However, theory building and testing is not the domain of only the highly educated and mathematically proficient. Almost everyone builds and test theories.

People build theories any time they do not know the answer to a question. Someone asks, "Why is the crime rate higher in the United States than in Belgium?" Or, "Why did Li Wei's girlfriend break up with him?" Or, "Why does Professor Avalos give easier final exams than Professor Shaw, even though they teach the same subject?" If you don't know the answer to a question, you are likely to build a theory so that you can provide an answer.

Theory
An abstract representation of the real world designed with the intent to better understand it.

Abstract
The process (used in building a theory) of focusing on a limited number of variables to explain or predict an event.

What exactly is a theory? To an economist, a **theory** is an abstract representation of the world. In this context, **abstract** means that you omit certain variables or factors when you try to explain or understand something. For example, suppose you were to draw a map for a friend, showing him how to get from his house to yours. Would you draw a map that showed every single thing your friend would see on the trip, or would you simply draw the main roads and one or two landmarks? If you'd do the latter, you would be abstracting from reality; you would be omitting certain things.

You would abstract for two reasons: First, to get your friend from his house to yours, you don't need to include everything on your map. Simply noting main roads may be enough. Second, if you did note everything on your map, your friend might get confused. Giving too much detail could be as bad as giving too little.

When economists build a theory or model, they do the same thing you do in drawing a map. They abstract from reality; they leave out certain things. They focus on the major factors or variables that they believe will explain the phenomenon they are trying to understand.

Suppose a criminologist's objective is to explain why some people turn to crime. Before actually building the theory, he considers a number of variables that may explain why some

people become criminals: (1) the ease of getting a gun, (2) child-rearing practices, (3) the neighborhood a person grew up in, (4) whether a person was abused as a child, (5) family education, (6) the type of friends a person has, (7) a person's IQ, (8) climate, and (9) a person's diet.

The criminologist may think that some of these variables greatly affect the chance that a person will become a criminal, some affect it only slightly, and others do not affect it at all. For example, a person's diet may have only a 0.0001 percent effect on the person becoming a criminal, whereas whether a person was abused as a child may have a 30 percent effect.

A theory emphasizes only the variables that the theorist believes are the main or critical ones that explain an activity or event. Thus, if the criminologist in our example thinks that parental child-rearing practices and family education are likely to explain much more about criminal behavior than the other variables are, then his (abstract) theory will focus on these two variables and ignore the others.

All theories are abstractions from reality. But it doesn't follow that (abstract) theories cannot explain reality. The objective in theory building is to ignore the variables that are essentially irrelevant to the case at hand, making it easier to isolate the important variables that the untrained observer would probably miss.

In the course of reading this text, you will come across numerous theories. Some of these theories are explained in words, and others are represented graphically. For example, Chapter 3 presents the theory of supply and demand. First, the parts of the theory are explained. Then the theory is represented graphically in terms of a supply curve and a demand curve.

What to Ask a Theorist Physicists, chemists, and economists aren't the only persons who build and test theories. Historians, sociologists, anthropologists, and many others build and test theories. In fact, as suggested earlier in this section, almost everyone builds theories (although not everyone tests theories).

Anytime you listen to someone expound on a theory, you should always ask a key question: "If your theory is correct, what do you predict we will see in the world?" To illustrate, let's consider a very simple example. Suppose your history professor comes to class each day clean shaven and dressed in slacks, shirt, and sports jacket. One day he comes to class unshaven and dressed in jeans and a somewhat wrinkled T-shirt. The difference in appearance is obvious. You turn to your friend who sits next to you in class and ask, "What do you think explains the difference in his appearance and dress?"

Notice that you have asked a question that does not have an obvious answer. Such questions are ripe for theory building. Your friend proposes an explanation. She says, "I think the professor forgot to set his alarm clock last night. He got up late this morning and didn't have time to shave or to dress the way he usually does. He just threw on the first clothes he found and rushed to class."

Your friend has advanced a theory of sorts. She has implicitly assumed that the professor wants to shave and dress in slacks, shirt, and sports jacket but that some unusual event prevented him from doing so today.

Somehow, you don't think your friend's theory is correct. Instead, you think your history professor has decided to make a life change of some sort. He has decided to look more casual, to take life a little easier, to be less formal. You tell your friend what you think explains your professor's new behavior.

You, like your friend, have advanced a theory of sorts. Whose theory, if either, is correct? Now is the time for you to ask your friend, and your friend to ask you, "If your theory is correct, what do you predict we will see in the world?"

Your friend's answer should be, "If *my* theory is correct, then the next time the professor comes to class, he will be clean shaven and dressed in his old way—slacks, shirt, and sports jacket." Your answer should be, "If *my* theory is correct, then the next time the professor comes to class, he will be unshaven and dressed as he is today—in jeans, T-shirt, and the like."

The question—If your theory is correct, what do you predict we will see in the world?—gives us a way to figure out who might be closer to the truth when people disagree. It minimizes talk and maximizes the chances of establishing who is correct and who is incorrect.

Self-Test

1. What is the purpose of building a theory?
2. How might a theory of the economy differ from a description of it?
3. Why is it important to test a theory? Why not simply accept a theory if it sounds right?
4. Your economics instructor says, "If the price of going to the movies goes down, people will go to the movies more often." A student in class says, "Not if the quality of the movies goes down." Who is right, the economics instructor or the student?

1-5 Economic Categories

Economics is sometimes broken down into different categories according to the type of questions asked. Four common economic categories are positive economics, normative economics, microeconomics, and macroeconomics.

1-5a Positive Economics and Normative Economics

Positive Economics
The study of *what is* in economics.

Normative Economics
The study of *what should be* in economics.

Positive economics attempts to determine *what is*. **Normative economics** addresses *what should be*. Essentially, positive economics deals with cause-effect relationships that can be tested. Normative economics deals with value judgments and opinions that cannot be tested.

Many topics in economics can be discussed in both a positive and a normative framework. Consider a proposed cut in federal income taxes. An economist practicing positive economics would want to know the *effect* of a cut in income taxes. For example, she may want to know how a tax cut will affect the unemployment rate, economic growth, inflation, and so on. An economist practicing normative economics would address issues that directly or indirectly relate to whether the federal income tax *should* be cut. For example, the economist may say that federal income taxes should be cut because the income tax burden on many taxpayers is currently high.

This book deals mainly with positive economics. For the most part, we discuss the economic world as it is, not the way someone might think it should be. Keep in mind, too, that no matter what your normative objectives are, positive economics can shed some light on how they might be accomplished. For example, suppose you believe that absolute poverty should be eliminated and that the unemployment rate should be lowered. No doubt you have ideas as to how these goals can be accomplished. But will your ideas work? For example, will a greater redistribution of income eliminate absolute poverty? Will lowering taxes lower the unemployment rate? There is no guarantee that the means you think will bring about certain ends will do so. This is where sound positive economics can help us see what is. As someone once said, "It is not enough to want to do good; it is important also to know how to do good."

1-5b Microeconomics and Macroeconomics

It has been said that the tools of microeconomics are microscopes and the tools of macroeconomics are telescopes. Macroeconomics stands back from the trees to see the forest. Microeconomics gets up close and examines the tree itself—its bark, its limbs, and its roots. **Microeconomics** is the branch of economics that deals with human behavior and choices as they relate to relatively small units: an individual, a firm, an industry, a single market. **Macroeconomics** is the branch of economics that deals with human behavior and choices as they relate to an entire economy. In microeconomics, economists discuss a single price; in macroeconomics, they discuss the price level. Microeconomics deals with the demand for a particular good or service; macroeconomics deals with aggregate, or total, demand for goods and services. Microeconomics examines how a tax change affects a single firm's output; macroeconomics looks at how a tax change affects an entire economy's output.

Microeconomics
The branch of economics that deals with human behavior and choices as they relate to relatively small units: an individual, a firm, an industry, a single market.

Macroeconomics
The branch of economics that deals with human behavior and choices as they relate to highly aggregate markets (e.g., the market for goods and services) or the entire economy.

Microeconomists and macroeconomists ask different types of questions. A microeconomist might be interested in answering such questions as the following:

- How does a market work?
- What level of output does a firm produce?
- What price does a firm charge for the good it produces?
- How does a consumer determine how much of a good to buy?
- Can government policy affect business behavior?
- Can government policy affect consumer behavior?

A macroeconomist, by contrast, might be interested in answering such questions as these:

- How does the economy work?
- Why is the unemployment rate sometimes high and sometimes low?
- What causes inflation?
- Why do some national economies grow faster than others?
- What might cause interest rates to be low one year and high the next?
- How do changes in the money supply affect the economy?
- How do changes in government spending and taxes affect the economy?

Office Hours

"I Don't Believe That Every Time a Person Does Something, He Compares the Marginal Benefits and Costs."

Student: In class yesterday, you said that individuals compare the marginal benefits (*MB*) of doing something (say, exercising) with the marginal costs (*MC*). If the marginal benefits are greater than the marginal costs, they exercise; if the marginal costs are greater than the marginal benefits, they don't. Here is what I am having a problem with: I don't believe that every time people do something, they compare the marginal benefits and costs. I think people do some things without thinking of benefits and costs; they do some things instinctively or because they have always done them.

Instructor: Can you give an example?

Student: I don't think of the benefits and costs of eating breakfast in the morning; I just eat breakfast. I don't think of the benefits and costs of doing my homework; I just do the homework before it is due. For me, many activities are automatic; I do them without thinking.

Instructor: It doesn't necessarily follow that you are not considering benefits and costs when you do something automatically. All you have to do is sense whether doing something comes with net benefits (benefits greater than costs) or net costs (costs greater than benefits). All you have to do is sense whether something is likely to make you better off or worse off. You eat breakfast in the morning because you have decided that it makes you better off. But making you better off is no different from saying that you receive net benefits from eating breakfast, which is no different from saying that the benefits of eating breakfast are greater than the costs. In other words, *better off* equals *net benefits* equals *benefits greater than costs*.

Student: I see what you're saying. But then how would you explain the fact that Caleb smokes cigarettes and Luis does not. If both Caleb and Luis consider the benefits and costs of smoking cigarettes, then it seems that either both would have to smoke or both would have to not smoke. The fact that different people do different things tells me that not everyone is considering the costs and benefits of their actions. If everyone did, they would all do the same thing.

Instructor: I disagree. Not everyone sees the costs and benefits of the same thing the same way. Caleb and Luis may not see the benefits or costs of smoking the same way. For Caleb, the benefits of smoking may be high, but for Luis, they may be low. It is no different from saying different people estimate the benefits of playing chess or eating a doughnut or riding a bicycle differently. The same holds for costs. Not everyone will estimate the costs of playing chess or eating a doughnut or riding a bicycle the same way. The costs of a person with diabetes eating a doughnut are much higher than the costs of a person without diabetes eating a doughnut.

Student: Let me see if I have this right. You are making two points. First, not everyone has the same benefits and costs of, say, running a mile. Second, everyone who does run a mile believes that the benefits are greater than the costs, and everyone who does not run a mile believes that the costs are greater than the benefits.

Instructor: Yes, that's it. All people are trying to make themselves better off (reap net benefits), but not all people will do *X* because not all people will be made better off by doing *X*.

Points to Remember

1. If you undertake those actions for which you expect to receive net benefits, then you are "thinking" in terms of costs and benefits. Specifically, you expect the marginal benefits to be greater than the marginal costs.
2. The costs and benefits of doing any activity are not necessarily the same for everybody. Caleb may expect higher benefits than Luis when it comes to doing *X*; Luis may expect higher costs than Caleb when it comes to doing *X*.

Chapter Summary

Goods, Bads, and Resources

- A good is anything that gives a person utility or satisfaction.
- A bad is anything that gives a person disutility or dissatisfaction.
- Economists divide resources into four categories: land, labor, capital, and entrepreneurship.
- Land includes natural resources, such as minerals, forests, water, and unimproved land.
- Labor is brought about by the physical and mental talents that people contribute to the production process.
- Capital consists of produced goods—such as machinery, tools, computers, trucks, buildings, and factories—that can be used as inputs for further production.
- Entrepreneurship is the talent that some people have for organizing the resources of land, labor, and capital to produce goods, seek new business opportunities, and develop new ways of doing things.

Scarcity

- Scarcity is the condition in which our wants are greater than the limited resources available to satisfy them.
- Scarcity implies choice. In a world of limited resources, we must choose which wants will be satisfied and which will go unsatisfied.
- Because of scarcity, there is a need for a rationing device. A rationing device is a means of deciding who gets what quantities of the available resources and goods.
- Scarcity implies competition. If resources were ample to satisfy all our seemingly unlimited wants, people would not have to compete for the available, but limited, resources.

Opportunity Cost

- Every time a person makes a choice, he or she incurs an opportunity cost. Opportunity cost is the most highly valued opportunity or alternative forfeited when a choice is made. The higher the opportunity cost of doing something, the less likely it is that it will be done.

Costs and Benefits

- What distinguishes the economist from the noneconomist is that the economist thinks in terms of *both* costs and benefits. Asked what the benefits of taking a walk may be, an economist will also mention the related costs. Asked what the costs of studying are, an economist will also point out its benefits.

Decisions Made at the Margin

- Marginal benefits and costs are not the same as total benefits and costs. When deciding whether to talk on the phone one more minute, an individual would not consider the total benefits and total costs of speaking on the phone. Instead, the person would compare only the marginal benefits (additional benefits) of talking on the phone one more minute with the marginal costs (additional costs) of talking on the phone one more minute.

Incentives

- An incentive is something that encourages or motivates a person to undertake an action. Incentives are closely related to benefits and costs. Individuals have an incentive to undertake actions for which the benefits are greater than the costs or, stated differently, for which they expect to receive some net benefits (benefits greater than costs).

Efficiency

- As long as the marginal benefits of an activity are greater than its marginal costs, a person gains by continuing to do the activity—whether the activity is studying, running, eating, or watching television. The net benefits of an activity are maximized when the marginal benefits of the activity equal its marginal costs. Efficiency exists at this point.

Unintended Effects

- Economists often think in terms of causes and effects. Effects may be either intended or unintended. Economists want to denote both types of effects when speaking of effects in general.

Exchange

- Exchange, or trade, is the process of giving up one thing for something else. People enter into exchanges to make themselves better off.

Ceteris Paribus

- *Ceteris paribus* is a Latin term that means "all other things constant" or "nothing else changes." *Ceteris paribus* is used to designate what we believe is the correct relationship between two variables.

Theory

- Economists build theories to explain and predict real-world events. Theories are necessarily abstractions from, as opposed to descriptions of, the real world.
- All theories abstract from reality; they focus on the critical variables that the theorist believes explain and predict the phenomenon in question.

Economic Categories

- Positive economics attempts to determine what is; normative economics addresses what should be.
- Microeconomics deals with human behavior and choices as they relate to relatively small units: an individual, a firm, an industry, a single market. Macroeconomics deals with human behavior and choices as they relate to an entire economy.

Key Terms and Concepts

Good
Utility
Bad
Disutility
Land
Labor
Capital
Entrepreneurship
Scarcity
Economics
Rationing Device
Opportunity Cost
Marginal Benefits
Marginal Costs
Decisions at the Margin
Efficiency
Incentive
Exchange (Trade)
Ceteris Paribus
Theory
Abstract
Positive Economics
Normative Economics
Microeconomics
Macroeconomics

Questions and Problems

1. The United States is considered a rich country because Americans can choose from an abundance of goods and services. How can there be scarcity in a land of abundance?
2. Give two examples for each of the following: (a) an intangible good, (b) a tangible good, (c) a bad.
3. Give an example of something that is a good for one person and a bad for someone else.
4. What is the difference between labor as a resource and entrepreneurship as a resource?
5. Can either scarcity or one of the effects of scarcity be found in a car dealership? Explain your answer.
6. Explain the link between scarcity and each of the following: (a) choice, (b) opportunity cost, (c) the need for a rationing device, and (d) competition.
7. Is it possible for a person to incur an opportunity cost without spending any money? Explain.
8. Discuss the opportunity costs of attending college for four years. Is college more or less costly than you thought it was? Explain.
9. Explain the relationship between changes in opportunity cost and changes in behavior.
10. Owen says that we should eliminate all pollution in the world. William disagrees. Who is more likely to be thinking like an economist, Owen or William? Explain your answer.
11. A friend pays for your lunch. Is this an example of a free lunch? Why or why not?
12. A noneconomist says that a proposed government project simply costs too much and therefore shouldn't be undertaken. How might an economist's evaluation be different?
13. Economists say that individuals make decisions at the margin. What does this mean?
14. How would an economist define the efficient amount of time spent playing tennis?
15. Ivan stops studying before the point at which his marginal benefits of studying equal his marginal costs. Is Ivan forfeiting any net benefits? Explain your answer.
16. What does an economist mean by saying that there are no $10 bills on the sidewalk?
17. A change in *X* will lead to a change in *Y*. The predicted change is desirable, so we should change *X*. Do you agree or disagree? Explain.
18. Why do people enter into exchanges?
19. When two individuals enter into an exchange, you can be sure that one person benefits and the other person loses. Do you agree or disagree with this statement? Explain your answer.
20. What is the difference between positive economics and normative economics? Between microeconomics and macroeconomics?
21. Would there be a need for a rationing device if scarcity did not exist? Explain your answer.
22. Jackie's alarm clock buzzes. She reaches over to the small table next to her bed and turns it off. As she pulls the covers back up, Jackie thinks about her 8:30 American History class. Should she go to the class today or sleep a little longer? She worked late last night and really hasn't had enough sleep. Besides, she's fairly sure her professor will be discussing a subject she already knows well. Maybe it would be okay to miss class today. Is Jackie more likely to miss some classes than she is to miss other classes? What determines which classes Jackie will attend and which classes she won't?
23. If you found $10 bills on the sidewalk regularly, we might conclude that individuals don't try to maximize net benefits. Do you agree or disagree with this statement. Explain your answer.

24. The person who smokes cigarettes cannot possibly be thinking in terms of costs and benefits because it has been proven that cigarette smoking increases one's chances of getting lung cancer. Do you agree or disagree with the part of the statement that reads "the person who smokes cigarettes cannot possibly be thinking in terms of costs and benefits"? Explain your answer.
25. Tamara decides to go out on a date with Liam instead of Terrance. Do you think Tamara is using some kind of rationing device to decide whom she dates? If so, what might that rationing device be?
26. A theory is an abstraction from reality. What does this statement mean?

Working with Numbers and Graphs

1. Suppose the marginal costs of reading are constant and the marginal benefits of reading decline (over time). Initially, the marginal benefits of reading are greater than the marginal costs. Draw the *marginal-benefit (MB)* curve and *marginal-cost (MC)* curve of reading, and identify the efficient amount of reading. Next, explain why the efficient point is the point at which the net benefits of reading are maximized.
2. Using the diagram you drew in question 1, lower the marginal costs of reading, and identify the new efficient amount of reading. Also, identify the additional net benefits derived as a result of the lower marginal cost of reading.
3. Jim could undertake activity *X*, but chooses not to. Draw how the *marginal-benefit (MB)* and *marginal-cost (MC)* curves look for activity *X* from Jim's perspective.

APPENDIX

A Working with Diagrams

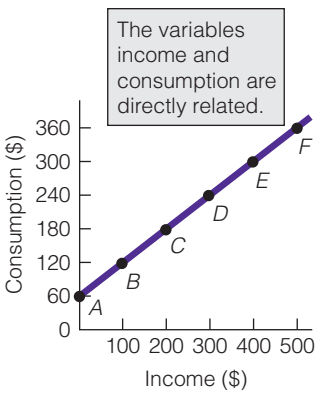
Most of the diagrams in this book represent the relationship between two variables. Economists compare two variables to see how a change in one variable affects the other.

Suppose our two variables of interest are *consumption* and *income*. We want to show how consumption changes as income changes. We collect the data in Table 1. Simply by looking at the data in the first two columns, we can see that as income rises (column 1), consumption rises (column 2). If we wanted to show the relationship between income and consumption on a graph, we could place *income* on the horizontal axis, as in Exhibit 1, and *consumption* on the vertical axis. Point *A* represents income of $0 and consumption of $60, point *B* represents income of $100 and consumption of $120, and so on. If we draw a straight line through the points we have plotted, we have a picture of the relationship between income and consumption, based on the data we collected.

EXHIBIT 1

A Two-Variable Diagram Representing a Direct Relationship

The data in Table 1, plotted. Then points are connected with a straight line. The data represent a direct relationship: As one variable (say, income) rises, the other variable (consumption) rises too.



Notice that the line in Exhibit 1 slopes upward from left to right. As income rises, so does consumption. For example, as you move from point *A* to point *B*, income rises from $0 to $100, and consumption rises from $60 to $120. The line in Exhibit 1 also shows that as income falls, so does consumption. For example, as you move from point *C* to point *B*, income falls from $200 to $100, and consumption falls from $180 to $120. When two variables—such as consumption and income—change in the same way, they are said to be **directly related**.

Directly Related
Two variables are directly related if they change in the same way.

Now let's take a look at the data in Table 2. Our two variables are the *price of T-shirts* and the *quantity demanded of T-shirts*. Just by looking at the data in the first two columns, we see that as price falls (column 1), quantity demanded rises (column 2). Suppose we want to plot these data. We could place *price of T-shirts* on the vertical axis, as in Exhibit 2, and *quantity demanded of T-shirts* on the horizontal axis. Point *A* represents a price of $20 and a quantity demanded

Table 1

(1) When Income Is ($)	(2) Consumption Is ($)	(3) Point
0	60	*A*
100	120	*B*
200	180	*C*
300	240	*D*
400	300	*E*
500	360	*F*

Table 2

(1) When Price of T-shirts Is ($)	(2) Quantity Demanded of T-shirts Is	(3) Point
20	100	*A*
18	120	*B*
16	140	*C*
14	160	*D*
12	180	*E*

of 100, point *B* represents a price of $18 and a quantity demanded of 120, and so on. If we draw a straight line through the plotted points, we have a picture of the relationship between price and quantity demanded, based on the data in Table 2.

Notice the following:

- As price falls, the quantity demanded rises. For example, as price falls from $20 to $18, the quantity demanded rises from 100 to 120.
- As price rises, the quantity demanded falls. For example, when price rises from $12 to $14, quantity demanded falls from 180 to 160.

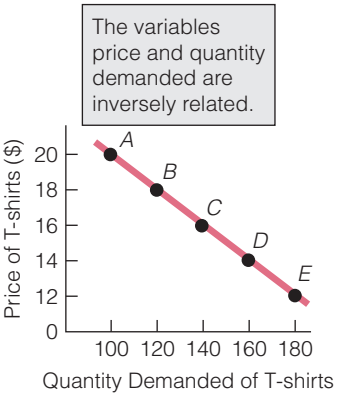
When two variables—such as price and quantity demanded—change in opposite ways, they are said to be **inversely related**.

As you have seen so far, variables may be directly related (when one increases, the other also increases) or inversely related (when one increases, the other decreases). Variables can also be **independent** of each other if, as one variable changes, the other does not.

EXHIBIT 2

A Two-Variable Diagram Representing an Inverse Relationship

The data in Table 2, plotted. The points are connected with a straight line. The data represent an inverse relationship: As one variable (price) falls, the other variable (quantity demanded) rises.



In Exhibit 3(a), as the *X* variable rises, the *Y* variable remains the same (at 20). Obviously, the *X* and *Y* variables are independent of each other: As one changes, the other does not.

In Exhibit 3(b), as the *Y* variable rises, the *X* variable remains the same (at 30). Again, we conclude that the *X* and *Y* variables are independent of each other: As one changes, the other does not.

Inversely Related
Two variables are inversely related if they change in opposite ways.

Independent
Two variables are independent if, as one changes, the other does not.

A-1 Slope of a Line

In addition to knowing *how* two variables are related, we also often need to know *how much* one variable changes as the other changes. To find out, we need to only calculate the slope of the line. The **slope** is the ratio of the change in the variable on the vertical axis to the change in the variable on the horizontal axis. For example, if *Y* is on the vertical axis and *X* is on the horizontal axis, the slope is equal to $\Delta Y/\Delta X$. (The symbol "Δ" means "change in.")

$$\text{slope} = \frac{\Delta Y}{\Delta X}$$

Slope
The ratio of the change in the variable on the vertical axis to the change in the variable on the horizontal axis.

EXHIBIT 3

Two Diagrams Representing Independence Between Two Variables

In parts (a) and (b), the variables *X* and *Y* are independent: As one changes, the other does not.

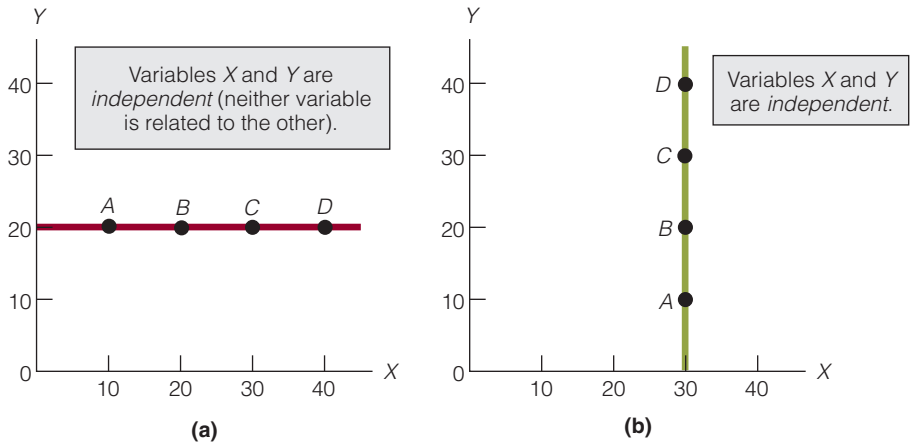


Exhibit 4 shows four lines. In each case, the slope is calculated. After studying parts (a)–(d), see if you understand why the slopes are negative, positive, zero, and infinite.

A-2 Slope of a Line is Constant

Look again at the line in Exhibit 4(a). The slope between points *A* and *B* is computed to be –1. If we had computed the slope between points *B* and *C* or between points *C* and *D*, would it still be –1? Let's compute the slope between points *B* and *C*. Moving from point *B* to point *C*, the change in *Y* is –10 and the change in *X* is +10. So, the slope is –1, as it was between points *A* and *B*. Now let's compute the slope between points *A* and *D*. Moving from point *A* to point *D*, the change in *Y* is –30 and the change in *X* is +30. Again, the slope is –1. Our conclusion is that the slope between any two points on a straight line is always the same as the slope between any other two points. To see this for yourself, compute the slope between points *A* and *B* and between points *A* and *C* using the line in Exhibit 4(b).

A-3 Slope of a Curve

In addition to straight lines, economics graphs use curves. The slope of a curve is not constant throughout, as it is for a straight line. The slope of a curve varies from one point to another. Calculating the slope of a curve at a given point requires two steps, as illustrated for point *A* in Exhibit 5. First, draw a line tangent to the curve at the point (a tangent line is one that just touches the curve but does not cross it). Second, pick any two points on the tangent line and determine the slope. In Exhibit 5, the slope of the line between points *B* and *C* is 0.67. The slope of the curve at point *A* (and only at point *A*) is therefore 0.67.

A-4 The 45-Degree Line

Economists sometimes use a *45-degree line* to represent data. This is a straight line that bisects the right angle formed by the intersection of the vertical and horizontal axes (see Exhibit 6). As a result, the 45-degree line divides the space enclosed by the two axes into *two equal parts*, as shown

EXHIBIT 4

Calculating Slopes

The slope of a line is the ratio of the change in the variable on the vertical axis to the change in the variable on the horizontal axis. In (a)–(d), we have calculated the slope.

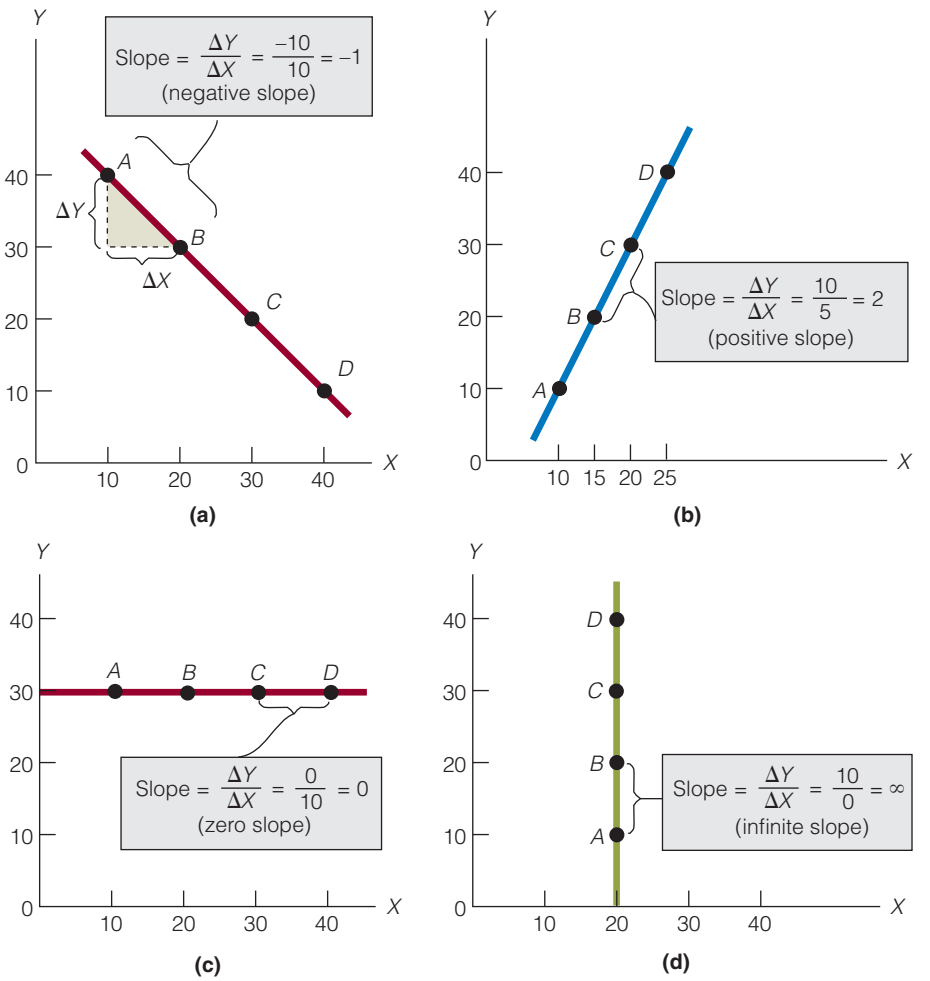


EXHIBIT 5

Calculating the Slope of a Curve at a Particular Point

The slope of the curve at point *A* is 0.67. This is calculated by drawing a line tangent to the curve at point *A* and then determining the slope of the line.

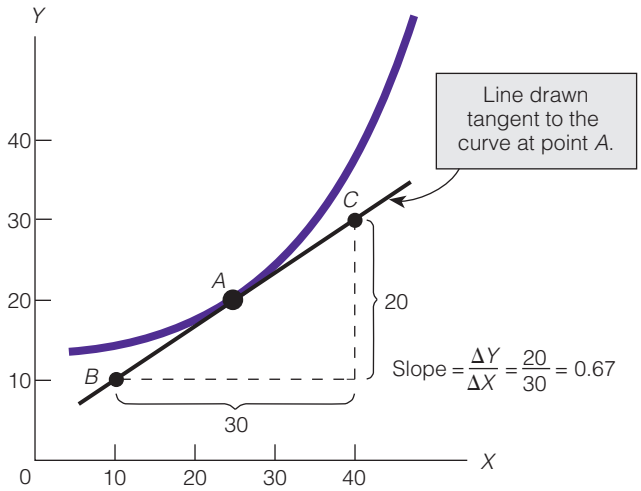
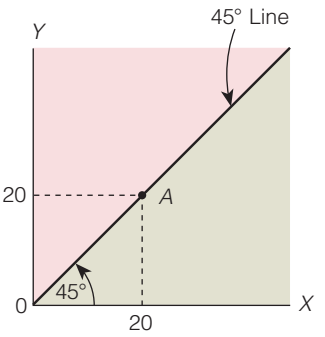


EXHIBIT 6

The 45-Degree Line

Any point on the 45-degree line is equidistant from each axis. For example, point *A* is the same distance from the vertical axis as it is from the horizontal axis.



in the exhibit by the shading in different colors. The major characteristic of the 45-degree line is that any point on it is equidistant from both the horizontal and vertical axes. For example, point *A* is exactly as far from the horizontal axis as it is from the vertical axis. Thus, point *A* represents as much *X* as it does *Y*. Specifically, in the exhibit, point *A* represents 20 units of *X* and 20 units of *Y*.

A-5 Pie Charts

Pie charts appear in numerous places throughout this text. A pie chart is a convenient way to represent the different parts of something that when added together equal the whole. Let's consider a typical 24-hour weekday for Charles Myers. On a typical weekday, Charles spends 8 hours sleeping, 4 hours taking classes at the university, 4 hours working at his part-time job, 2 hours doing homework, 1 hour eating, 2 hours watching television, and 3 hours doing nothing in particular ("hanging around"). Exhibit 7 shows the breakdown of a typical weekday for Charles in pie chart form.

Pie charts send a quick visual message about rough percentage breakdowns and relative relationships. For example, Exhibit 7 clearly shows that Charles spends twice as much time working as doing homework.

Gross Domestic Product (GDP)
The value of the entire output produced annually within a country's borders.

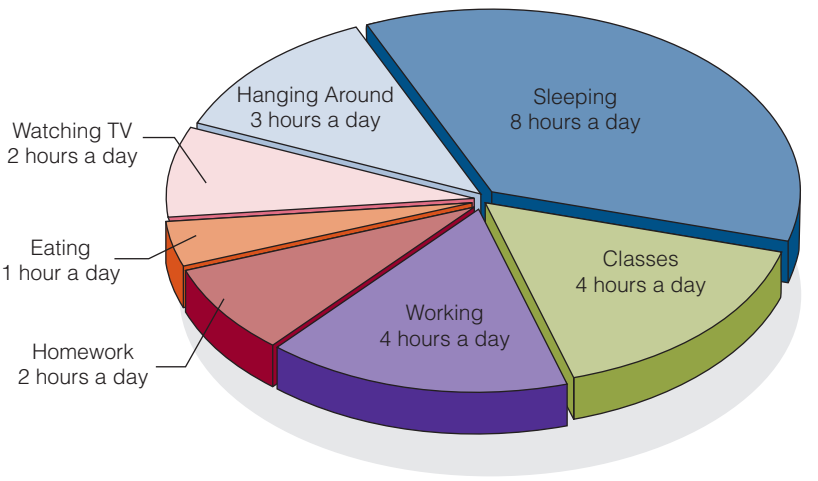
A-6 Bar Graphs

The *bar graph* is another visual aid that economists use to convey relative relationships. Suppose we want to represent the gross domestic product for the United States in different years. The **gross domestic product (GDP)** is the value of the entire output produced annually within

EXHIBIT 7

A Pie Chart

The breakdown of activities for Charles Myers during a typical 24-hour weekday is represented in pie chart form.



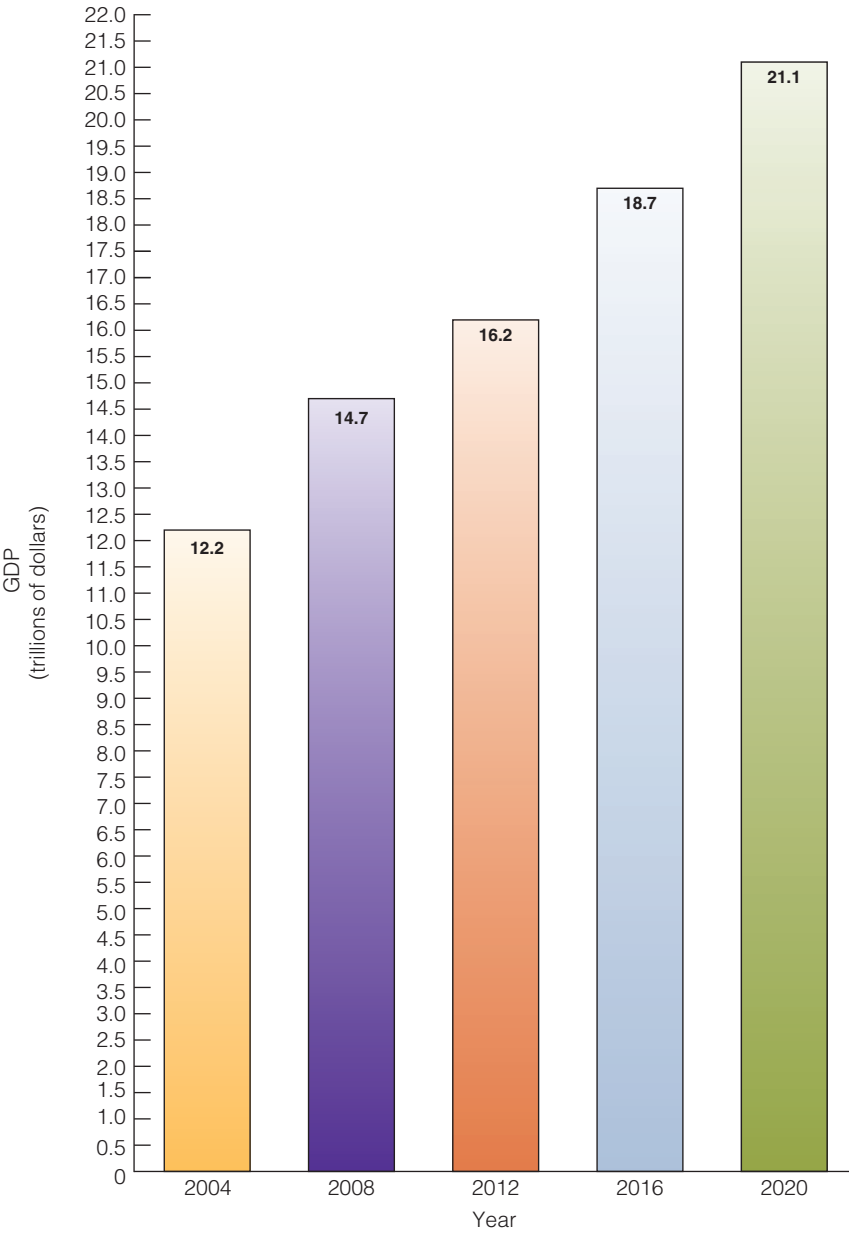
a country's borders. The bar graph in Exhibit 8 is a quick picture not only of the actual GDP for each year but also of the relative relationships between the GDP numbers for different years.

EXHIBIT 8

A Bar Graph

U.S. gross domestic product for different years is illustrated in bar graph form.

Source: Bureau of Economic Analysis.



A-7 Line Graphs

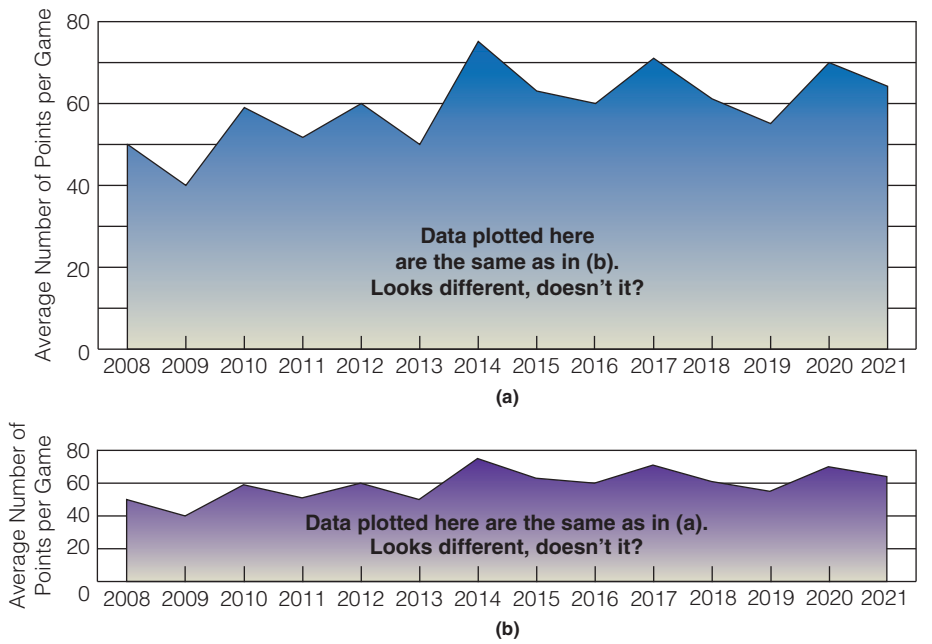
Sometimes information is best and most easily displayed in a *line graph*, which is particularly useful for illustrating changes in a variable over a time period. Suppose we want to illustrate the variations in average points per game for a college basketball team over a number of years. The line graph in Exhibit 9(a) shows that the basketball team was on a roller coaster during the years 2008–2021. Perhaps the visual message is that the team's performance has not been consistent from one year to the next.

Suppose we plot the same data again, except this time using a different measurement scale on the vertical axis. As you can see in Exhibit 9(b), the variation in the team's performance appears much less pronounced than in part (a). In fact, we could choose a scale that, if we were to plot the data, would give us something close to a straight line. The point is simple: Data plotted in a line graph may convey different messages depending on the measurement scale used. Sometimes economists show two line graphs on the same axes. Usually, the purpose is to draw attention to either (1) the *relationship* between two variables or (2) the *difference* between them. In Exhibit 10, the line graphs show the variation and trend in (1) projected federal government expenditures and (2) projected tax receipts for the years 2022–2026, drawing attention to the "gap" between the two over the years.

EXHIBIT 9

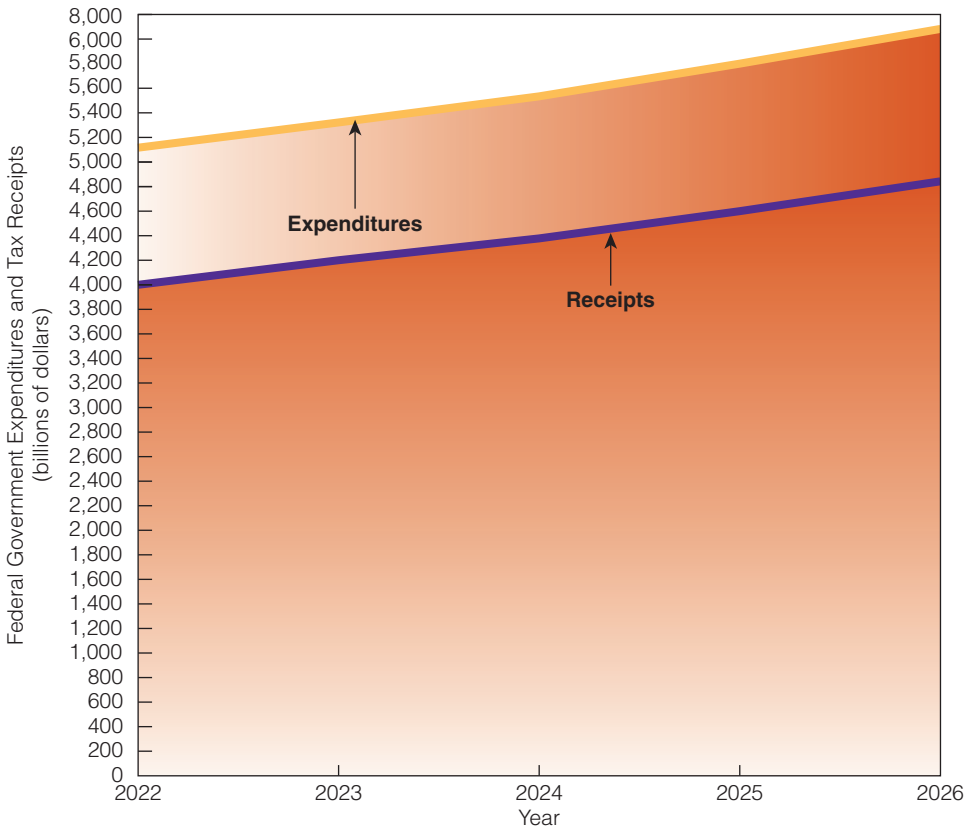
The Two Line Graphs Plot the Same Data

(a) The average numbers of points per game for a college basketball team in different years are plotted. The variation between the years is pronounced. (b) The same data as in (a), but the variation in the performance of the team appears much less pronounced than in part (a).



Year	Average Number of Points per Game
2008	50
2009	40
2010	59
2011	51
2012	60
2013	50
2014	75
2015	63
2016	60
2017	71
2018	61
2019	55
2020	70
2021	64

EXHIBIT 10



Projected Federal Government Expenditures and Tax Receipts, 2022–2026

Projected federal government expenditures and tax receipts are shown in line graph form for the period 2022–2026. Numbers are in billions of dollars.

Year	Expenditures	Receipts
2022	5,117	4,001
2023	5,325	4,206
2024	5,534	4,382
2025	5,877	4,562
2026	6,184	4,851

Source: Congressional Budget Office.

Appendix Summary

- Two variables are directly related if one variable rises as the other rises.
- An upward-sloping line (left to right) represents two variables that are directly related.
- Two variables are inversely related if one variable rises as the other falls.
- A downward-sloping line (left to right) represents two variables that are inversely related.
- Two variables are independent if one variable rises as the other remains constant.
- The slope of a line is the ratio of the change in the variable on the vertical axis to the change in the variable on the horizontal axis. The slope of a straight line is the same between any two points on the line.
- To determine the slope of a curve at a point, draw a line tangent to the curve at the point and then determine the slope of the tangent line.
- Any point on a 45-degree line is equidistant from the two axes.
- A pie chart is a convenient way to represent the different parts of something that when added together equal the whole. A pie chart visually shows rough percentage breakdowns and relative relationships.
- A bar graph is a convenient way to represent relative relationships.
- Line graphs are particularly useful for illustrating changes in one or more variables over time.

Key Terms and Concepts

Directly Related
Inversely Related
Independent
Slope
Gross Domestic Product (GDP)

Questions and Problems

1. What type of relationship would you expect between the following?
   a. Sales of hot dogs and sales of hot dog buns
   b. The price of winter coats and sales of winter coats
   c. The price of personal computers and the production of personal computers
   d. Sales of toothbrushes and sales of cat food
   e. The number of children in a family and the number of toys in a family
2. Represent the following data in bar graph form.

Year	U.S. Money Supply ($ billions)
2016	3,347
2017	3,642
2018	3,765
2019	3,952

3. Plot the following data, and specify the type of relationship between the two variables. (Place "Price" on the vertical axis and "Quantity Demanded" on the horizontal axis.)

Price of Apples ($)	Quantity Demanded of Apples
0.25	1,000
0.50	800
0.70	700
0.95	500
1.00	400
1.10	350

4. In Exhibit 4(a), determine the slope between points *C* and *D*.
5. In Exhibit 4(b), determine the slope between points *A* and *D*.
6. What is the special characteristic of a 45-degree line?
7. What is the slope of a 45-degree line?
8. When is a pie chart better than a bar graph for illustrating data?
9. Plot the following data, and specify the type of relationship between the two variables. (Place "Price" on the vertical axis and "Quantity Supplied" on the horizontal axis.)

Price of Apples ($)	Quantity Supplied of Apples
0.25	350
0.50	400
0.70	500
0.95	700
1.00	800
1.10	1,000