You're in school!
Did you make the right decision?

Getting Started

When you have completed your study of this chapter, you will be able to

1 Define economics and explain the kinds of questions that economists try to answer.

2 Explain the ideas that define the economic way of thinking.

3 Explain how economists work as social scientists and policy advisers.

4 Describe the jobs available to an economics major and explain how economics is useful as a job skill and life skill.

1.1   DEFINITION AND QUESTIONS

Well, did you make the right decision? Is being in school the best use of your time? You'll soon know how an economist answers this question—for it is an economic question. It arises from the fact that you want more than you can get. You want to be in school. But you also want the time to enjoy your favorite sports and movies, to travel, and to hang out with friends—time that right now you don't have because you've got classes to attend and assignments due. Your time is scarce.

■ Scarcity

Scarcity
The condition that arises because wants exceed the ability of resources to satisfy them.

Our inability to satisfy all our wants is called **scarcity**. The ability of each of us to satisfy our wants is limited by the time we have, the incomes we earn, and the prices we pay for the things we buy. These limits mean that everyone has unsatisfied wants. The ability of all of us as a society to satisfy our wants is limited by the productive resources that exist. These resources include the gifts of nature, our labor and ingenuity, and the tools and equipment that we have made.

Everyone, poor and rich alike, faces scarcity. A student wants Ariana Grande's latest album and a paperback but has only $10.00 in his pocket. He faces scarcity. John Legend wants to spend a week on the set of *The Voice* in L.A., but he also wants to devote time and energy to pursuing Broadway opportunities. He faces scarcity. The U.S. government wants to increase spending on homeland security and cut taxes. It faces scarcity. Your state government wants improved healthcare, an Internet connection in every classroom, clean lakes and rivers, and so on. It, too, faces scarcity. Scarcity is everywhere: Even parrots face scarcity!

Faced with scarcity, we must make choices. We must choose among the available alternatives. The student must choose the download or the paperback. John Legend must choose shooting episodes of *The Voice* or pursuing Broadway projects. Governments must choose among greater security, tax cuts, improved healthcare, classroom computers, the environment, and so on.

Not only do I want a cracker—we all want a cracker!

Frank Modell/The New Yorker Collection/The Cartoon Bank

■ Economics Defined

Economics
The social science that studies the choices that individuals, businesses, and governments make as they cope with *scarcity*, all the things that influence those choices, and the arrangements that coordinate them.

Economics is the social science that studies the choices that individuals, businesses, and governments make as they cope with *scarcity*, all the things that influence those choices, and the arrangements that coordinate them.

The subject has two broad parts:

- Microeconomics, and
- Macroeconomics

Microeconomics

Microeconomics
The study of the choices that individuals and businesses make and the way these choices interact and are influenced by governments.

Microeconomics is the study of the choices that individuals and businesses make and the way these choices interact and are influenced by governments. Some examples of microeconomic questions are: Will you buy a 4K TV or a standard one? Will Nintendo sell more units of Wii if it cuts the price? Will a cut in the income tax rate encourage people to work longer hours? Will a hike in the gas tax encourage more people to drive hybrid or smaller automobiles? Is video streaming killing movie theaters?

Macroeconomics

Macroeconomics is the study of the aggregate (or total) effects on the national economy and the global economy of the choices that individuals, businesses, and governments make. Some examples of macroeconomic questions are: Why did production and jobs expand in the United States during 2017 and 2018? Why are incomes growing much faster in China and India than in the United States? Why is unemployment in Europe so high? Why are Americans borrowing more than $1 billion a day from the rest of the world?

Two big questions define the scope of economics:

- How do choices end up determining *what, how,* and *for whom* goods and services get produced?
- When do choices made in the pursuit of *self-interest* also promote the *social interest*?

Macroeconomics
The study of the aggregate (or total) effects on the national economy and the global economy of the choices that individuals, businesses, and governments make.

■ What, How, and For Whom?

Goods and services are the objects and actions that people value and produce to satisfy human wants. Goods are *objects* that satisfy wants. Sports shoes and ketchup are examples. Services are *actions* that satisfy wants. Haircuts and rock concerts are examples. We produce a dazzling array of goods and services that range from necessities such as food, houses, and healthcare to leisure items such as video streaming and roller coaster rides.

Goods and services
The objects (goods) and the actions (services) that people value and produce to satisfy human wants.

What?

What determines the quantities of corn we grow, homes we build, and healthcare services we produce? Sixty years ago, farm output was 5 percent of total U.S. production. Today, it is 1 percent. Over the same period, the output of mines, construction, and utilities slipped from 9 percent to 8 percent of total production and manufacturing fell from 28 percent to 13 percent. These decreases in output are matched by increases in the production of a wide range of services, up from 58 percent of total production 60 years ago to 78 percent today. How will these quantities change in the future as ongoing changes in technology make an ever-wider array of goods and services available to us?

How?

How are goods and services produced? In a vineyard in France, bucket-carrying workers pick the annual grape crop by hand. In a vineyard in California, a huge machine does the same job. Look around and you will see many examples of this phenomenon—the same job being done in different ways. In some stores, check-out clerks scan the goods and in others, shoppers choose self-checkout. One farmer uses paper-and-pencil records to track his livestock feeding schedules and inventories while another uses a computer. In some plants, GM hires workers to weld auto bodies and in others it uses robots to do the job.

Why do we use machines in some cases and people in others? Do mechanization and technological change destroy more jobs than they create? Do they make us better off or worse off?

In France, grape pickers do the same job as a huge machine in a California vineyard.

For Whom?

For whom are goods and services produced? The answer depends on the incomes that people earn and the prices they pay for the goods and services they buy. At given prices, a person who has a high income is able to buy more goods and services than a person who has a low income. Doctors earn much higher incomes than do nurses and medical assistants, so doctors get more of the goods and services produced than nurses and medical assistants get.

You probably know about many other persistent differences in incomes. Men, on average, earn more than women. Whites, on average, earn more than minorities. College graduates, on average, earn more than high school graduates. Americans, on average, earn more than Europeans, who in turn earn more, on average, than Asians and Africans. But there are some significant exceptions. The people of Japan and Hong Kong now earn an average income similar to that of Americans. And there is a lot of income inequality throughout the world.

What determines the incomes we earn? Why do doctors earn larger incomes than nurses? Why do men earn more, on average, than women? Why do college graduates earn more, on average, than high school graduates? Why do Americans earn more, on average, than Africans?

Economics explains how the choices that individuals, businesses, and governments make and the interactions of those choices end up determining *what, how,* and *for whom* goods and services are produced. In answering these questions, we have a deeper agenda in mind. We're not interested in just knowing how many Alexa devices are produced, how they are produced, and who gets to enjoy them. We ultimately want to know the answer to the second big economic question that we'll now explore.

A doctor gets more of the goods and services produced than a nurse or a medical assistant gets.

■ Can the Pursuit of Self-Interest Be in the Social Interest?

Every day, you and 329 million other Americans, along with 7.6 billion people in the rest of the world, make economic choices that result in *"what," "how,"* and *"for whom"* goods and services are produced.

Are the goods and services produced, and the quantities in which they are produced, the right ones? Are the scarce resources used in the best possible way? Do the goods and services we produce go to those who benefit most from them?

Self-Interest and the Social Interest

Choices that are the best for the individual who makes them are choices made in the pursuit of **self-interest**. Choices that are the best for everyone are said to be in the **social interest**. The social interest has two dimensions: *efficiency* and *equity*. We'll explore these concepts in later chapters. For now, think of efficiency as being achieved by baking the biggest possible pie, and think of equity as being achieved by sharing the pie in the fairest possible way.

You know that your own choices are the best ones for you—or at least you *think* they're the best at the time that you make them. You use your time and other resources in the way that you think is best. You might consider how your choices affect other people, but you order a home delivery pizza because you're hungry and want to eat, not because you're concerned that the delivery person or the cook needs an income. You make choices that are in your self-interest—choices that you think are best for you.

Self-interest
The choices that are best for the individual who makes them.

Social interest
The choices that are best for society as a whole.

When you act on your economic decisions, you come into contact with thousands of other people who produce and deliver the goods and services that you decide to buy or who buy the things that you sell. These people have made their own decisions—what to produce and how to produce it, whom to hire or whom to work for, and so on. Like you, all these people make choices that they think are best for them. When the pizza delivery person shows up at your home, he's not doing you a favor. He's earning his income and hoping for a good tip.

Can it be possible that when each one of us makes choices that are in our own best interest—in our self-interest—it turns out that these choices are also the best choices for society as a whole—in the social interest?

Adam Smith, regarded as the founder of economic science, (see *Eye on the Past* on p. 56) said the answer is *yes*. He believed that when we pursue our self-interest, we are led by an *invisible hand* to promote the social interest.

Is Adam Smith correct? Can it really be possible that the pursuit of self-interest promotes the social interest? Much of the rest of this book helps you to learn what economists know about this question and its answer. To help you start thinking about the question, we're going to illustrate it with four topics that generate heated discussion in today's world. You're already at least a little bit familiar with each one of them. They are

- Globalization
- The information revolution
- Climate change
- Government budget deficit and debt

Globalization

Globalization—the expansion of international trade and the production of components and services by firms in other countries—has been going on for centuries. But in recent years, its pace has accelerated. Microchips, satellites, and fiber-optic cables have lowered the cost of communication and globalized production decisions. When Nike produces more sports shoes, people in Malaysia get more work. When Steven Spielberg makes a new movie, programmers in New Zealand write the code that makes magical animations. And when China Airlines wants a new airplane, Americans who work for Boeing build it.

Globalization is bringing rapid income growth, especially in Asia. But globalization is leaving some people behind. Jobs in manufacturing and routine services are shrinking in the United States, and some nations of Africa and South America are not sharing in the prosperity enjoyed in other parts of the world.

Workers in Asia make our shoes.

The owners of multinational firms benefit from lower production costs and consumers benefit from low-cost imported goods. But don't displaced American workers lose? And doesn't even the worker in Malaysia, who sews your new shoes for a few cents an hour, also lose? Is globalization in the social interest, or does globalization benefit just some at the expense of others?

The Information Revolution

We are living at a time of extraordinary economic change that has been called the *Information Revolution*. This name suggests a parallel with the *Industrial Revolution* of the 1800s and the *Agricultural Revolution* of 12,000 years ago.

The changes that have occurred during the last 40 years are based on one major technology: the microprocessor or computer chip. The spin-offs from faster

and cheaper computing have been widespread in telecommunications, music, and the automation of millions of tasks that previously required human decisions. You encounter some of these tasks when you check out at the grocery store or use an ATM. Less visible, but larger in scope, are the robots that assemble cars and move goods around warehouses. Over the next 20 years, more than one third of today's jobs will be done by a new generation of robots.

The computing and robot revolution resulted from people pursuing their self-interest. Gordon Moore, the chip maker who set up Intel, and Bill Gates, who quit Harvard to set up Microsoft, weren't thinking how much easier it would be for you to turn in your essay on time if you had a computer. Moore and Gates and thousands of other entrepreneurs were in pursuit of big rewards. Yet their actions made many other people better off. They advanced the social interest.

But are resources used in the best possible way? Or do Intel and Microsoft set their prices too high and put their products out of reach for too many people? And is it in the social interest for robots to take people's jobs?

Robots fill orders at Amazon.

Climate Change

The Earth is getting hotter and the ice at the two poles is melting. Since 1880, the Earth's surface temperature has increased by 1.4 degrees Fahrenheit, and two thirds of that increase has occurred since 1975.

Most climate scientists believe that the current warming has come at least in part from human economic activity—from self-interested choices—and that, if left unchecked, the warming will bring large future economic costs.

Are the individual energy choices that each of us makes damaging the social interest? What needs to be done to make our choices serve the social interest? Would the United States joining with other nations to limit carbon emissions serve the social interest? What other measures might be introduced?

Human activity is raising the Earth's surface temperature.

Government Budget Deficit and Debt

Every year since 2000, the U.S. government has run a budget deficit. On average, the government has spent $1.66 billion a day more than it has received in taxes. The government's debt has increased each day by that amount. Over the period from 2000 to 2019, government debt increased by $12 trillion. Your personal share of the government debt in 2019 is $35,000.

This large deficit and debt is just the beginning of an even bigger problem. From about 2020 onwards, the retirement and healthcare benefits to which older Americans are entitled are going to cost increasingly more than current taxes can cover. With no changes in tax or benefit rates, the budget deficit will increase and the debt will swell ever higher.

Deficits and the debts they create cannot persist indefinitely, and debts must somehow be repaid. They will most likely be repaid by you, not by your parents. When we make our voter choices, we pursue our self-interest. Do our choices serve the social interest? Do the choices made by politicians and bureaucrats in Washington and the state capitals promote the social interest, or do they only serve their own self-interests?

The four issues we've just reviewed raise questions that are hard to answer. We'll return to each of them at various points throughout this text and explain when the social interest is served and when there remain problems to be solved.

A government budget time bomb is ticking as spending grows faster than tax revenues.

CHECKPOINT 1.1

Define economics and explain the kinds of questions that economists try to answer.

Practice Problems

1. Economics studies choices that arise from one fact. What is that fact?
2. Provide three examples of wants in the world today that are not satisfied.
3. In the following news items, find examples of the *what*, *how*, and *for whom* questions: "With better technology, we can increase crops"; "New policy of local restaurants: first come, first served"; "Robots replace workers in wool factories."
4. How does a new Starbucks in Beijing, China, influence self-interest and the social interest?
5. How does Facebook influence self-interest and the social interest?

In the News

Ageing and health
The World Health Organization (WHO) expects that there will be a demographic shift due to the increased pace of ageing of the world's population.
Source: *World Health Organization*, September 2015

How does the WHO expect *what* and *for whom* goods and services are produced to change in the years to come?

Solutions to Practice Problems

1. The fact is scarcity—human wants exceed the resources available.
2. Examples include ending famine in Africa, decreasing pollution and the global warming problem, and finding cures for terminal diseases.
3. Better technology is a *how* question, and increasing crops is a *what* question. First-come, first-served is a *for whom* question. Robots replace workers is a *how* question, wool factories is a *what* question.
4. Decisions made by Starbucks are in Starbucks' self-interest but they also serve the self-interest of its customers and so contribute to the social interest.
5. Facebook serves the self-interest of its investors, users, and advertisers. It also serves the social interest by enabling people to share information.

Solutions to In the News

The WHO expects that goods and services targeting seniors, specifically health-care services, increase in the future. For whom they are produced will depend on the standard of living of the ageing population and the prices of these goods and services.

1.2   THE ECONOMIC WAY OF THINKING

The definition of economics and the kinds of questions that economists try to answer give you a flavor of the scope of economics. But they don't tell you how economists *think* about these questions and how they go about seeking answers to them. You're now going to see how economists approach their work.

We'll break this task into two parts. First, we'll explain the ideas that economists use to frame their view of the world. These ideas will soon have you thinking like an economist. Second, we'll look at economics both as a social science and as a policy tool that governments, businesses, and *you* can use.

Six ideas define the *economic way of thinking*:

- A choice is a *tradeoff*
- *Cost* is what you *must give up* to get something.
- *Benefit* is what you gain from something.
- People make *rational choices* by comparing benefits and costs.
- Most choices are "*how much*" choices made at the *margin.*
- Choices respond to *incentives.*

■ A Choice Is a Tradeoff

Tradeoff
An exchange—giving up one thing to get something else.

A **tradeoff** is an exchange—giving up one thing to get something else. Because we face scarcity, we must make choices. And when we make a choice, we select from the available alternatives. You can think about choices as tradeoffs. When you choose one thing, you give up something else that you could have chosen.

Think about what you will do on Saturday night. You can spend the night studying for your next economics test or having fun with your friends, but you can't do both of these activities at the same time. You must choose how much time to devote to each. Whatever choice you make, you could have chosen something else. When you choose how to spend your Saturday night, you face a tradeoff between studying and hanging out with your friends. To get more study time, you must give up some time with your friends.

■ Cost: What You *Must* Give Up

Opportunity cost
The opportunity cost of something is the best thing you must give up to get it.

The **opportunity cost** of something is the best thing you must give up to get it. You most likely think about the cost of something as the money you must spend to get it. But dig a bit deeper. If you spend $10 on a movie ticket, you can't spend it on a sandwich. The movie ticket really costs a sandwich. The *cost* of something is what must be given up to get it, not the money spent on it. Economists use the term *opportunity cost* to emphasize this view of cost.

The biggest opportunity cost you face is that of being in school. This opportunity cost has two components: things you can't afford to buy and things you can't do with your time.

Start with the things you can't afford to buy. You've spent all your income on tuition, residence fees, books, and a laptop. If you weren't in school, you would have spent this money on tickets to ball games and movies and all the other things that you enjoy. But that's only the start of the things you can't afford to buy because you're in school. You've also given up the opportunity to get a job and buy the things that you could afford with your higher income. Suppose that the

The opportunity cost of being in school includes things you can't buy and do.

best job you could get if you weren't in school is working as a coffee shop manager earning $24,000 a year. Another part of your opportunity cost of being in school is all the things that you would buy with that extra $24,000.

Now think about the time that being a student eats up. You spend many hours each week in class, doing homework assignments, preparing for tests, and so on. To do all these school activities, you must give up what would otherwise be time spent playing your favorite sport, time watching movies, and leisure time spent with your friends.

The opportunity cost of being in school is the best alternative things that you can't afford and that you don't have the time to enjoy. You might put a dollar value on this cost but the cost is the goods and services and time that you give up, not dollars.

The opportunity cost of being in school includes forgone earnings.

■ Benefit: What You Gain

The **benefit** of something is the gain or pleasure that it brings, measured by what you are *willing to give up* to get it. Benefit is determined by personal *preferences*—by what a person likes and dislikes and the intensity of those feelings. If you get a huge kick out of Fortnite, that video game brings you a large benefit. And if you have little interest in listening to Yo Yo Ma playing a Vivaldi cello concerto, that activity brings you a small benefit.

Some benefits are large and easy to identify, such as the benefit that you get from being in school. A big piece of that benefit is the goods and services that you will be able to enjoy with the boost to your earning power when you graduate. Some benefits are small, such as the benefit you receive from a slice of pizza.

Economists measure benefit as the most that a person is *willing to give up* to get something. You are willing to give up a lot for something that brings a large benefit. For example, because being in school brings a large benefit, you're *willing to give up* a lot of time and goods and services to get that benefit. But you're willing to give up very little for something that brings a small benefit. For example, you might be willing to give up one iTunes download to get a slice of pizza.

Benefit
The benefit of something is the gain or pleasure that it brings, measured by what you are *willing to give up* to get it.

■ Rational Choice

A basic idea of economics is that in making choices, people act rationally. A **rational choice** is one that uses the available resources to best achieve the objective of the person making the choice.

But how do people choose rationally? The answer is by comparing the *benefits* and *costs* of the alternative choices and choosing the alternative that makes *net benefit*—benefit minus cost—as large as possible.

You have chosen to be a student. If that choice is rational, as economists assume, your benefit from being in school exceeds the cost, so your net benefit is maximized by being in school. For an outstanding baseball player, a high earning potential makes the opportunity cost of school higher than the benefit from school, so for that person, net benefit is maximized by choosing full-time sport. (*Eye on the Benefit and Cost of School* on p. 48 explores these examples more closely.)

The benefit of a choice is determined by the preferences of the person making the choice, so two people can make different rational choices even if they face the same cost. For example, you might like chocolate ice cream more than vanilla ice cream, but your friend prefers vanilla. So it is rational for you to choose chocolate and for your friend to choose vanilla.

Rational choice
A choice that uses the available resources to best achieve the objective of the person making the choice.

A rational choice might turn out not to have been the best choice after the fact. For example, a farmer might decide to plant wheat rather than soybeans. Then, when the crop comes to market, the price of soybeans might be much higher than the price of wheat. The farmer's choice was rational when it was made, but subsequent events made it less profitable than the alternative choice.

All the rational choices we've just considered (school or not, chocolate or vanilla ice cream, soybeans or wheat) involve choosing between two things. One or the other is chosen. We call such choices *all-or-nothing* choices. Many choices are of this type, but most choices involve *how much* of an activity to do.

■ How Much? Choosing at the Margin

You can allocate the next hour between studying and video chatting with your friends, but the choice is not all or nothing. You must decide how many minutes to allocate to each activity. To make this decision, you compare the benefit of a little bit more study time with its cost—you make your choice *at the margin*.

Other words for "margin" are "border" or "edge." You can think of a choice at the margin as one that adjusts the border or edge of a plan to determine the best course of action. Making a choice at the **margin** means comparing the relevant alternatives systematically and incrementally.

Marginal Cost

The opportunity cost of a one-unit increase in an activity is called **marginal cost**. The marginal cost of something is what you *must* give up to get *one additional* unit of it. Think about your marginal cost of going to the movies for a third time in a week. Your marginal cost of seeing the movie is what you must give up to see that one additional movie. It is *not* what you give up to see all three movies. The reason is that you've already given up something to see two movies, so you don't count that cost when making a decision to see the third movie.

The marginal cost of any activity increases as you do more of it. You know that going to the movies decreases your study time and lowers your grade. Suppose that seeing a second movie in a week lowers your grade by five percentage points. Seeing a third movie will lower your grade by more than five percentage points. Your marginal cost of moviegoing is increasing as you see more movies.

Marginal Benefit

The benefit of a one-unit increase in an activity is called **marginal benefit**. Marginal benefit is what you gain from having *one more* unit of something. But the marginal benefit of something is *measured* by what you *are willing* to give up to get that *one additional* unit of it.

A fundamental feature of marginal benefit is that it diminishes. Think about movies and your marginal benefit. If you've been studying hard and haven't seen a movie this week, your marginal benefit of seeing your next movie is large. But if you've been on a movie binge this week, you now want a break and seeing another movie gives you a small marginal benefit.

Because the marginal benefit of a movie decreases as you see more movies, you are willing to give up less to see one additional movie. For example, you know that going to the movies decreases your study time and lowers your grade. You pay for seeing a movie with a lower grade. You might be willing to give up ten percentage points to see your first movie in a week, but you won't be willing to take such a big hit on your grade to see a second movie in a week. Your willingness to pay to see a movie decreases as the number of movies increases.

Margin
A choice on the margin is a choice that is made by comparing *all* the relevant alternatives systematically and incrementally.

Marginal cost
The opportunity cost that arises from a one-unit increase in an activity. The marginal cost of something is what you *must* give up to get *one additional* unit of it.

Marginal benefit
The benefit that arises from a one-unit increase in an activity. The marginal benefit of something is *measured* by what you *are willing* to give up to get *one additional* unit of it.

Making a Rational Choice

So, will you go to the movies for that third time in a week? The answer is found by comparing marginal benefit and marginal cost.

If the marginal cost of the movie is less than its marginal benefit, seeing the third movie adds more to benefit than to cost. Your net benefit increases, so your rational choice is to see the third movie.

If the marginal cost of the movie exceeds its marginal benefit, seeing the third movie adds more to cost than to benefit. Your net benefit decreases, so your rational choice is to spend the evening studying.

When the marginal benefit of something equals its marginal cost, the choice is rational and it is not possible to make a better choice. Scarce resources are being used in the best possible way.

■ Choices Respond to Incentives

The choices we make depend on the incentives we face. An **incentive** is a reward or a penalty—a "carrot" or a "stick"—that encourages or discourages an action. We respond positively to "carrots" and negatively to "sticks." The carrots are marginal benefits; the sticks are marginal costs. A change in marginal benefit or a change in marginal cost changes the incentives that we face and leads us to change our actions.

Most students believe that the payoff from studying just before a test is greater than the payoff from studying a month before a test. In other words, as a test date approaches, the marginal benefit from studying increases and the incentive to study becomes stronger. For this reason, we observe an increase in study time and a decrease in leisure pursuits during the last few days before a test. And the more important the test, the greater is this effect.

A change in marginal cost also changes incentives. For example, suppose that last week, you found your course work easy and you scored 100 percent on your practice quizzes. You figured that the marginal cost of taking an evening off to enjoy a movie was low and that your grade on the next test would not suffer, so you headed to the Cineplex. But this week the going has gotten tough. You're just not getting it, and your practice test scores are low. If you take off even one evening this week, your grade on the next test will suffer. The marginal cost of seeing a movie is now high, so you decide to give the movies a miss.

A central idea of economics is that by observing *changes in incentives*, we can predict how *choices change*.

Incentive
A reward or a penalty—a "carrot" or a "stick"—that encourages or discourages an action.

Changes in marginal benefit and marginal cost change the incentive to study or to enjoy a movie.

EYE on the BENEFIT AND COST OF SCHOOL

Did You Make the Right Decision?

Your decision to be in school is an economic decision. You faced a tradeoff between school, a job, and leisure time. You compared benefits and costs, and you responded to incentives.

Did you make the right decision when you chose school over a full-time job? Or, if you have a full-time job and you're studying in what would be your leisure time, did you make the right choice? Does school provide a big enough benefit to justify its cost?

The Benefits of School

Being in school has many benefits for which people are willing to pay. They fall into two broad categories: present enjoyment and a higher future income.

You can easily make a list of all the fun things you do with your friends in school that would be harder to do if you didn't have these friends and opportunities for social interaction that school provides.

Putting a dollar value on the items in your list would be hard, but it is possible to put a dollar value, or rather an expected dollar value, on the other benefit—a higher future income.

A high-school graduate earns, on average, an annual income of $40,000 a year. A graduate with a bachelor's degree earns, on average, $76,000 a year.

So by being in school, you can expect (on average) to increase your annual earnings by $36,000 a year.

This number is likely to grow as the economy becomes more productive and prices and earnings rise.

The Costs of School

The opportunity cost of being in school is your best forgone alternative. It is all the things you would have been able to enjoy if you were not in school. An opportunity cost is goods and services and time that must be forgone. Putting a dollar value on opportunity cost for a full-time student includes

- Tuition
- Expenditure on books and other study aids
- Forgone earnings

For a student attending a state university in her or his home state, tuition is around $10,000 per year.

Books and other study aids cost around $1,000 per year.

Forgone earnings are the wage of a high-school graduate in a starter job, which is around $24,000 a year.

So the total cost of being in school is about $35,000 per year or $105,000 for a 3-year degree and $140,000 for a 4-year degree.

Net Benefit

The benefit of extra earnings alone brings in $36,000 a year or $360,000 in 10 years and $1,440,000 in a working life of 40 years.

But you are incurring the costs now while you won't enjoy the benefits until some time in the future. We need to lower the benefits to compare them properly with the costs. You'll learn how to do that later in your economics course. But even allowing for the fact that the costs are incurred now while the benefits are received in the future, the net benefit is big!

Is School Always Best?

At the age of 18, Clayton Kershaw was offered a baseball scholarship at Texas A & M. The scholarship wouldn't have covered all the costs of school, but it would have lowered them a long way below those that you face.

But Clayton had an alternative to school. He was considered the top high-schooler available entering the 2006 MLB Draft and he was offered a signing bonus by the Los Angeles Dodgers said to be $2.3 million.

Clayton turned down the baseball scholarship at Texas A & M and signed with the Dodgers.

As the starting pitcher, Clayton's value to the Dodgers is high and earned him a salary of $30 million.

Clayton Kershaw's opportunity cost of a college education vastly exceeded the benefit he could expect to get from it. So, like you, he made the right decision.
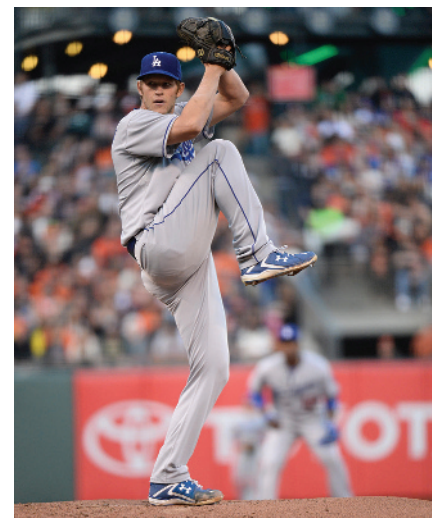
CHECKPOINT 1.2

Explain the ideas that define the economic way of thinking.

Practice Problems

Every week, Kate plays tennis for two hours, and her grade on each math test is 70 percent. Last week, after playing for two hours, Kate decided to play for another hour and cut her study time by one hour. But last week, her math grade fell to 60 percent. Use this information to work Problems **1** to **4**.

1.   What was Kate's opportunity cost of the third hour of tennis?
2.   Given that Kate played the third hour, what can you conclude about her marginal benefit and marginal cost of the second hour of tennis?
3.   Was Kate's decision to play the third hour of tennis rational?
4.   Did Kate make her decision on the margin?

In the News

The cruise industry boom is primed to continue
Since the recovery from the 2008 recession, the cruise business has been booming, which tells us that Americans look for more adventure and view their vacations as valuable and necessary.

Source: *Forbes*, September 1, 2018

1.   In deciding whether to take a cruise, would you face a tradeoff?
2.   How would you make a rational choice about taking a cruise?
3.   What would be your marginal benefit of a cruise? What would be your marginal cost of a cruise?
4.   Why would you expect a lower price to increase the number of people who decide to take a cruise?

Solutions to Practice Problems

1.   Kate's opportunity cost of the third hour of tennis was the drop in her grade of ten percentage points.
2.   The marginal benefit of the second hour of tennis must have exceeded the marginal cost of the second hour because Kate chose to play the third hour.
3.   If marginal benefit exceeded marginal cost, Kate's decision was rational.
4.   Kate made her decision on the margin because she compared the benefit and cost of one more hour (marginal benefit and marginal cost).

Solutions to In the News

1.   You would face a tradeoff because you would have to forgo something else that you might otherwise do with your resources (time and budget).
2.   You would make a rational choice by comparing the marginal benefit of a cruise and the marginal cost of taking one.
3.   Your marginal benefit of a cruise is the most you are willing to pay for one. Your marginal cost is what you would have to pay to take a cruise.
4.   With a lower price, the marginal benefit will exceed the lower price for more people and they will choose to take a cruise.

1.3   ECONOMICS AS A SOCIAL SCIENCE AND POLICY TOOL

Economics is a social science and a toolkit for advising on policy decisions.

■ Economics as a Social Science

Economists try to understand and predict the effects of economic forces by using the *scientific method* first developed by physicists. The scientific method is a commonsense way of systematically checking what works and what doesn't work. It begins with a question about cause and effect arising from some observed facts. An economist might wonder why computers are getting cheaper and more computers are being used. Are computers getting cheaper because more people are buying them, or are more people buying computers because they are getting cheaper? Or is a third factor causing both the price fall and the quantity increase?

Economic Models

Economic model
A description of the economy or a part of the economy that includes only those features assumed necessary to explain the observed facts.

A scientist's second step is to build a model that provides a possible answer to the question of interest. All sciences use models. An **economic model** is a description of the economy or a part of the economy that includes only those features assumed necessary to explain and understand the observed facts.

A model is like a map. If you want to drive from *A* to *B* in an unfamiliar city, you use a street map; and you get more useful information from the map than you would get from a satellite photograph!

In economics, we use mathematical and graph-based models. The questions posed above about the price and quantity of computers bought are answered by a graph-based model called "demand and supply" that you will study in Chapter 4.

Check Predictions of Models Against Facts

A scientist's third step is to check the predictions of a proposed model against the facts. Physicists check whether their models correspond to the facts by doing experiments. Economists have a harder time than physicists, but they still approach the task in a scientific manner. To check predictions of a model against facts, economists use natural experiments, statistical investigations, and laboratory experiments.

A natural experiment is a situation that arises in the ordinary course of economic life in which the one factor of interest is different and other things are equal (or similar). For example, Canada has higher unemployment benefits than the United States, but the people in the two nations are similar. So to study the effect of unemployment benefits on the unemployment rate, economists might compare the United States with Canada.

A statistical investigation looks for a *correlation*—a tendency for the values of two variables to move together (either in the same direction or in opposite directions) in a predictable and related way. For example, cigarette smoking and lung cancer are correlated. Sometimes a correlation shows a causal influence of one variable on the other. Smoking causes lung cancer. But sometimes the direction of causation is hard to determine.

A laboratory experiment puts people (often students) in a decision-making situation and varies the influence of one factor at a time to discover how they respond to changed incentives. Some economists (neuroeconomists) are now studying what happens in the brain of a decisionmaker.
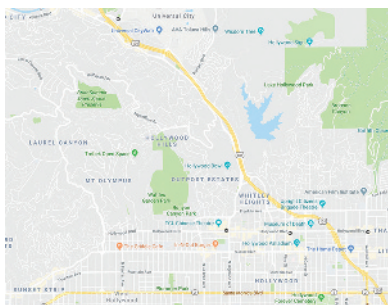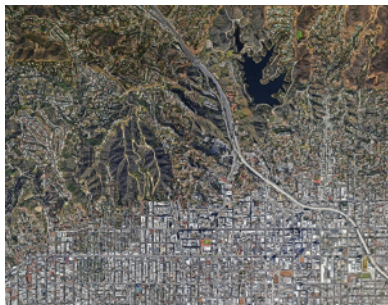
The top image shows what is visible—it depicts reality. The lower image is a model. Which is more useful if you want to drive from Universal City to Sunset Strip?

Disagreement: Normative versus Positive

Economists sometimes disagree. Some disagreements can be settled by checking facts, but others cannot.

Disagreements that can't be settled by facts are *normative*—disagreements about what *should be.* The statement "We *should* burn less coal" is normative. You may agree or disagree with it, but you can't test it. It doesn't assert a fact that can be checked. Social scientists try to steer clear of normative statements.

Disagreements that *can* be settled by facts are *positive*—disagreements about *what is*. These disagreements can be settled by careful observation of facts. "Burning coal raises the temperature of the planet" is a positive statement. It can be tested. Sometimes the facts are hard to get and sometimes they are hard to interpret, so disagreement persists. It is an ongoing feature of a healthy science.

■ Economics as a Policy Tool

All the policy questions on which economists provide advice involve a positive and normative blend. Economics can't help with the normative part—the policy goal. But it can help to clarify the goal. And for a given goal, economics provides the tools for evaluating alternative solutions and finding the solution that makes the best use of the available resources.

For example, if a policy goal is to reduce poverty, economists can explain whether a rise in the minimum wage will achieve that goal.

Some of the most famous economists work partly as policy advisers. Janet Yellen left her job as a professor at the University of California, Berkeley, to become Chair of the Federal Reserve board of governors.

CHECKPOINT 1.3

Explain how economists work as social scientists and policy advisers.

Practice Problem

Distinguish between positive and normative statements and provide an example of each.

In the News

The *New York Times* reports that New York City plans to charge drivers a congestion fee in 2021. How would an economist study the effect of this policy change?

Solution to Practice Problem

A positive statement is a statement of fact that can be checked, such as "grocery prices are rising." A normative statement is an opinion that cannot be checked, such as "tuition should be based on family income."

Solution to In the News

As a social scientist, an economist would construct a traffic-flow model. As a policy adviser, an economist would evaluate the benefits and costs of the change, and estimate the fee that would reduce congestion to the planned level.

1.4   ECONOMICS AS A LIFE SKILL AND JOB SKILL

What jobs are available to an economics major? Is the number of economics jobs likely to grow or shrink? How much do economics majors earn? And what are the skills needed for an economics job?

◼ Jobs for an Economics Major

A major in economics opens the door to the pursuit of a master's or Ph.D. and a career as an economist. Relatively few people take this path, but for those who do, the challenges are exciting and job satisfaction is high. An economics major is also a solid foundation for graduate programs in law, business, public health, and many other fields.

Some economics majors create their own businesses. A famous example is Fred Smith, who as an undergraduate at Yale wrote a term paper that envisioned the technology that led him to create FedEx.

But most economics graduates work in private firms, government, and international organizations, where they collect and analyze data, predict future trends, and study ways of using resources more efficiently. Writing reports and giving talks are a big part of the job of an economist.

An economics major also opens the door to a range of jobs that have the word "analyst" in the title. Three of these jobs, that between them employ almost one million people, are market research analyst, financial analyst, and budget analyst.

A *market research analyst* works with data on buying patterns and forecasts the likely success of a product and the price that buyers are willing to pay for it.

A *financial analyst* studies trends and fluctuations in interest rates and stock and bond prices and tries to predict the cost of borrowing and the returns on investments.

A *budget analyst* keeps track of an organization's cash flow—its receipts and payments—and prepares budget plans and predictions of future cash flows.

Figure 1.1 shows the scale and distribution of employment across the jobs for an economics major.

◼ **FIGURE 1.1**

Economics Jobs

The table shows the number of jobs for economists and analysts that use economic ideas and tools in 2014 and the projected numbers in 2024.

The pie chart shows the relative number of jobs.

Most of the jobs for an economics major are in market research (58 percent) and finance (32 percent).

Employment in	2014	2024
Economist	21,500	22,700
Budget analyst	60,800	62,300
Financial analyst	277,600	310,000
Market research analyst	495,500	587,800
Total jobs	855,400	982,800

Market research analyst (58%)

Economist (3%)

Budget analyst (7%)

Financial analyst (32%)
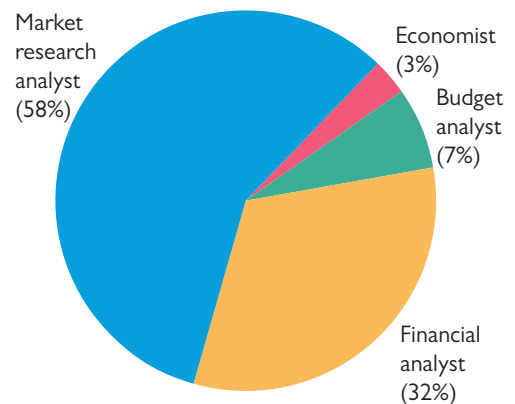
SOURCE OF DATA: Bureau of Labor Statistics.

■ Will the Number of Economics Jobs Grow?

The Bureau of Labor Statistics forecasts that between 2014 and 2024, jobs for

- economists with a Ph.D. will grow by 6 percent.
- budget analysts will grow by 2 percent.
- financial analysts will grow by 12 percent.
- market research analysts will grow by 19 percent.

Big data—the explosion of data and the profit opportunities that arise from analyzing it—will increase the demand for those who can make sense of and discover patterns in the data. Economics majors will be among these people.

■ How Much Do Economics Majors Earn?

Earnings of economics majors vary a lot depending on the job and the level of qualifications. The Web resource payscale.com reports a pay range for economists from $41,226 to $124,177, with a median of $72,279.

The American Economic Association reports that economics majors earn about $100,000 a year, and only graduates who major in chemical engineering and applied math have average pay that exceeds that of economists.

Figure 1.2 shows the earnings of graduates in economics and other subjects.

■ Skills Needed for Economics Jobs

What are the skills that an employer looks for in a candidate for an economics-related job? Five skill requirements stand out:

- Critical-thinking skills
- Analytical skills
- Math skills
- Writing skills
- Oral communication skills

FIGURE 1.2

Earnings of Economics Majors
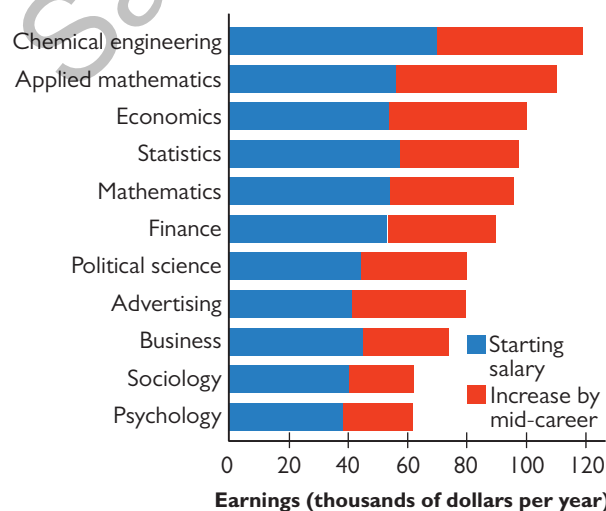
Economics majors are not the highest earners—chemical engineers and applied mathematicians earn more—but at **$100,000** a year in mid-career, economists earn more than most other majors.

SOURCE OF DATA: American Economic Association.

Critical-Thinking Skills

The ability to clarify and solve problems using logic and relevant evidence

Analytical Skills

The use of economic ideas and tools to examine data, notice patterns, and reach a logical conclusion

Math Skills

The ability to use mathematical and statistical tools to analyze data and reach valid conclusions

Writing Skills

The ability to present ideas, conclusions, and reasons in succinct written reports appropriate for the target audience

Oral Communication Skills

The ability to explain ideas, conclusions, and reasons in conversations with colleagues and in business meetings

■ Economics for Life

Economics is also a life skill. Economics provides you with the skills and tools for making decisions in all aspects of your life:

- Personal
- Business
- Government
- Community

Personal Decisions

You must decide whether to take a student loan or look for a better-paying job; to rent an apartment or borrow and buy a condo; and how to allocate your time between studying, working, volunteering, caring for others, and having fun. And everyone must decide how to vote in an upcoming election.

Business Decisions

Sony must decide whether to compete with Apple in the smartphone market. Chevron must decide whether to get more oil from the Gulf of Mexico or from Alaska. Marvel Studios must decide what its next movie will be.

Government Decisions

The U.S. government must decide whether to penalize corporations that send jobs overseas and whether to limit cheap imports of cars and trucks.

Community Decisions

People must decide whether to volunteer for a garbage-clearing project, to run in a charity marathon, and to join an early morning walking group.

Economics provides a toolkit for making them and the many more that arise in the daily course of life.

EYE on YOUR LIFE
Your Time Allocation

Your time is a scarce resource and how you allocate it impacts the quality of your life. Your physical fitness depends on how much time you allocate to sports and exercise, and your grade depends on the amount of time you allocate to studying.

Sleeping, personal care, eating and drinking, and traveling take a large chunk of your time, but you have choices about how much time to allocate to each of these activities. You also have choices about how much time to spend working for an income, enjoying sports and other leisure activities, and on educational activities (attending class, doing assignments, and studying).

Do you know the number of hours per day that you allocate to sleeping, personal care, eating and drinking, traveling, working, sports and leisure, and educational activities?

Here is a critical thinking question for you: Who works harder, you or the average student?

This question is one of fact, but answering requires agreement on what we mean by "works harder" and requires some data (the facts).

Let's agree that we will measure how hard a person works as the average number of hours per weekday spent working and on educational activities.

Next, we need the facts about time allocation—data about your time use and the time use of an average student.

The table above has eight activities and two columns for data. Complete the first column based on your current best guess about your time use.

Now keep a calendar for a normal week, and calculate your actual average hours for each activity. At the end of the week, complete the second column of the table.

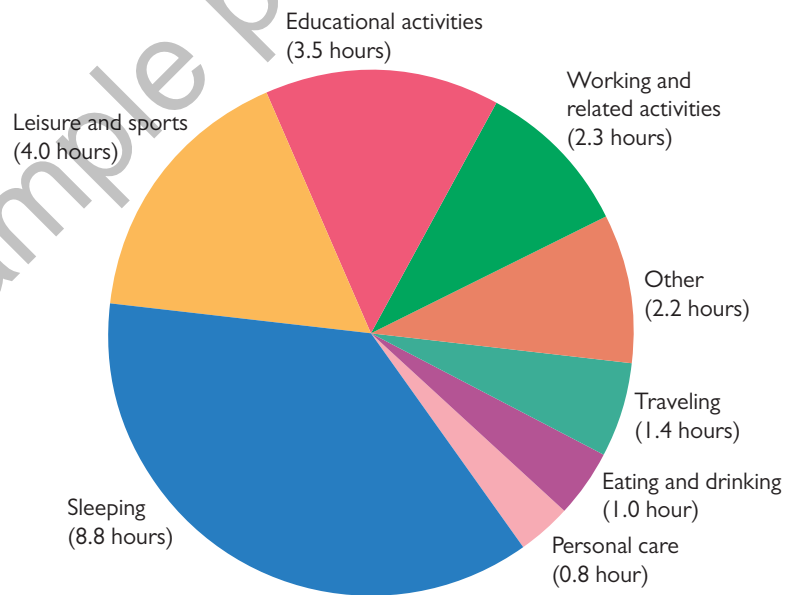How do your actual numbers compare with your guesses? Are there any surprises?

Now we need to compare your time use with that of the average student. The Bureau of Labor Statistics has conducted a survey to get the facts and Figure 1 below shows what it found.

So, what is the answer? Are there any more surprises? Who works more hours, you or the average student?

Does the answer make you want to change your time allocation?

Your Time Use		
Activity	**Guess**	**Actual average**
	(hours per day)	
Sleeping		
Personal care		
Eating and drinking		
Traveling		
Working and related activities		
Leisure and sports		
Educational activities		
Other		
Total	**24.0**	**24.0**

Educational activities (3.5 hours)
Working and related activities (2.3 hours)
Leisure and sports (4.0 hours)
Other (2.2 hours)
Traveling (1.4 hours)
Eating and drinking (1.0 hour)
Personal care (0.8 hour)
Sleeping (8.8 hours)

Figure 1 Time Use for Full-Time Students

Source of data: Bureau of Labor Statistics, American Time Use Survey, average on non-holiday weekdays for full-time university and college students 2011–2015.

EYE on the PAST
Adam Smith and the Birth of Economics as a Social Science

Many people had written about economics before Adam Smith did, but he made economics a social science.

Born in 1723 in Scotland, Smith became a full professor at 28 and published his masterpiece, *An Inquiry into the Nature and Causes of the Wealth of Nations,* in 1776.

Adam Smith asked: Why are some nations wealthy while others are poor? His answer: Through the division of labor and free markets, nations become wealthy. To illustrate his argument, he used the example of a pin factory. He guessed that one person, using the hand tools available in the 1770s, might make 20 pins a day. Yet, he observed, by using the same hand tools but breaking the process into a number of individually small tasks in which people specialize—by the division of labor—ten people could make a staggering 48,000 pins a day.

But a large market is needed to support the division of labor: One factory employing ten workers would need to sell more than 15 million pins a year to stay in business!

Smith saw free competitive markets as a source of wealth. The self-interested pursuit of profit, led by an invisible hand, resulted in resources being used in ways that created the greatest possible value and wealth.

CHECKPOINT 1.4

Describe the jobs available to an economics major and explain how economics is useful as a job skill and life skill.

Practice Problem

What types of jobs do graduates with an economics major do?

In the News

Economics graduates top earnings table
Economics graduates in the United Kingdom top the earnings table.
Source: *The Guardian*, November 27, 2018

Do the American Economic Association data for the United States agree with this news clip?

Solution to Practice Problem

Economists work in private firms, government, and international organizations. An economics major opens the door to a range of analyst jobs that include market research, financial markets, and budgeting.

Solution to In the News

The American Economic Association data in Figure 1.2 show that U.S. graduates in chemical engineering and applied math earn more than economics graduates.

CHAPTER SUMMARY

Key Points

1. Define economics and explain the kinds of questions that economists try to answer.

- Economics is the social science that studies choices coping with scarcity and the incentives that influence and reconcile these choices.
- Microeconomics is the study of individual choices and interactions, and macroeconomics is the study of the national economy and global economy.
- A big question of economics is: How do the choices that people make end up determining *what, how,* and *for whom* goods and services are produced?
- A second big question is: When do choices made in the pursuit of *self-interest* also promote the *social interest*?

2. Explain the ideas that define the economic way of thinking.

- Six ideas define the economic way of thinking:
  1. A choice is a *tradeoff.*
  2. *Cost* is what you *must* give up to get something.
  3. *Benefit* is what you *are willing to* give up to get something.
  4. People make *rational* choices by comparing benefits and costs.
  5. A "how much" choice is made on the *margin* by comparing *marginal benefit* and *marginal cost.*
  6. Choices respond to *incentives.*

3. Explain how economists work as social scientists and policy advisers.

- Economists use the *scientific method* to try to understand how the economic world works. They create economic models and test them using natural experiments, statistical investigations, and laboratory experiments.
- As policy advisers, economists clarify goals and evaluate solutions.

4. Describe the jobs available to an economics major and explain how economics is useful as a job skill and life skill.

- Economics majors work in a wide range of jobs as economists and analysts.
- The job outlook for economics majors is good and pay is above average.
- Economics and the economic way of thinking are foundations on which to build critical thinking and other skills for jobs and life.

Key Terms

Benefit, 45
Economic model, 50
Economics, 38
Goods and services, 39
Incentive, 47
Macroeconomics, 39

Margin, 46
Marginal benefit, 46
Marginal cost, 46
Microeconomics, 38
Opportunity cost, 44
Rational choice, 45

Scarcity, 38
Self-interest, 40
Social interest, 40
Tradeoff, 44

CHAPTER CHECKPOINT

Problems and Applications

1. Provide three examples of scarcity that illustrate why even the 1,826 billionaires in the world face scarcity.

2. Label each entry in List 1 as dealing with a microeconomic topic or a macroeconomic topic. Explain your answer.

Use the following information to work Problems **3** to **6**.

Jurassic World had world-wide box office receipts of $1.66 billion. The movie's production budget was $150 million with additional marketing costs. A successful movie brings pleasure to millions, creates work for thousands, and makes a few people rich.

3. What contribution does a movie like *Jurassic World* make to coping with scarcity? When you buy a movie ticket, are you buying a good or a service?

4. Who decides whether a movie is going to be a blockbuster? How do you think the creation of a blockbuster movie influences *what, how*, and *for whom* goods and services are produced?

5. What are some of the components of marginal cost and marginal benefit that the producer of a movie faces?

6. Suppose that Chris Pratt had been offered a part in another movie and that to hire him for *Jurassic World*, the producer had to double Chris Pratt's pay. What incentives would have changed? How might the changed incentives have changed the choices that people made?

7. What is the social interest? Distinguish it from self-interest. In your answer give an example of self-interest and an example of social interest.

8. Dina, Mina, and Tina are deciding on the Birthday Party of their close friend Gina. Dina hates balloons, is happy to get birthday cupcakes, but prefers a big birthday cake. Mina prefers birthday cupcakes, has no problem with a big birthday cake, she also likes to have balloons filling the place. Cupcakes destroy the mood of Tina, she prefers to surprise Gina with balloons, but she's equally satisfied to buy a big birthday cake instead. They decide to buy a big birthday cake. Is this decision rational? What is the opportunity cost of the cake for each of them? What is the benefit that each gets?

9. Label each of the entries in List 2 as a positive or a normative statement.

Use the following information to work Problems **10** to **12**.

Italy is giving away over 100 castles for free—there's only one catch
Under a new scheme backed by the Ministry of Tourism, Italy is giving away castles, monasteries, and farmhouses for free to investors for 9 years, with the option to extend for an additional 9 years. The catch is that investors should transform these sites into tourist attractions.

Source: CNBC, May 18, 2017

10. With Italy giving away castles for free, explain what is free and what is scarce.

11. What's the Italian government's incentive to give away these buildings for free? Was this decision made in self-interest or in the social interest? Explain.

12. How do the potential investors benefit from this scheme?

13. Read *Eye on the Benefit and Cost of School* on p. 48. When deciding about the offered scholarship, if Clayton Kershaw was guaranteed that he'd be made coach of the Dodgers once he graduates, a position that would earn him $60 million a year, would he have accepted the scholarship or would he have immediately signed with the Dodgers?

LIST 1

- Motor vehicle production in China is growing by 10 percent a year.
- Coffee prices skyrocket.
- Globalization has reduced African poverty.
- The government must cut its budget deficit.
- Apple sells 20 million iPhone 6 smartphones a month.

LIST 2

- Fixed-income receivers get hurt by inflation.
- World population is growing continuously.
- Way too many companies are outsourcing production to China.
- If tax on cigarettes is increased, smoking decreases.
- Protecting the environment should be the number one concern of world leaders.

Additional Problems and Applications

1. Read *Eye on the Benefit and Cost of School* on p. 48 and explain which of the following items are components of the opportunity cost of being a full-time college student who lives at home. The things that the student would have bought with
   - A higher income
   - Expenditure on tuition
   - A subscription to the *Rolling Stone* magazine
   - The income the student will earn after graduating

2. Think about the following news items and label each as involving a *what, how,* or *for whom* question:
   - Today, most stores use computers to keep their inventory records, whereas 20 years ago most stores used paper records.
   - Healthcare professionals and drug companies recommend that Medicaid drug rebates be made available to everyone in need.
   - An increase in the gas tax pays for low-cost public transit.

3. The headlines in List 1 are from an imaginary newspaper. Classify each headline as a signal that the news article is about a microeconomic topic or a macroeconomic topic. Explain your answers.

4. Your school decides to increase the intake of new students next year. To make its decision, what economic concepts would it have considered? Would the school have used the "economic way of thinking" in reaching its decision? Would the school have made its decision on the margin?

5. Provide examples of (a) a monetary incentive and (b) a non-monetary incentive, a carrot and a stick of each, that governments use to influence behavior.

6. Think about each of the items in List 2 and explain how they affect incentives and might change the choices people make.

7. Does the decision to make a blockbuster movie mean that some other more desirable activities get fewer resources than they deserve? Is your answer positive or normative? Explain your answer.

8. Provide two examples of economics being used as a tool by (a) a student, (b) a business, and (c) a government. Classify your examples as dealing with microeconomic topics and macroeconomic topics.

LIST 1

- XYZ Bank on Brink of Bankruptcy
- Brain Drain hits Firefly Island
- Good Crop, Wheat Price Falls
- Inflation Scare Again?

LIST 2

- Terrorists announce that the next attacks will hit the subway metro system in Europe.
- A rare disease kills a huge number of cows, which leads to skyrocketing of the price of milk.
- The price of DSLR cameras plummets to the €100 range.
- Studies find that lack of physical activity increases the risk of certain types of cancer.

Use the following news clip to work Problems **9** to **11**.

To vaccinate or not debate: Italy is succumbing to eradicable diseases
The vaccination debate is taking a toll on Italy after a recent outbreak of measles in March 2017. Vaccination is on the decrease in Italy after links were made to autism in a study. Opponents to vaccination do not trust the government and the pharmaceutical industry, whereas proponents are afraid of dire health consequences if opting out of vaccination becomes a legal option.

Source: *Financial Times*, April 19, 2017

9. What are the benefits of making vaccination compulsory for all? Who benefits: citizens, the government, or pharmaceutical companies?

10. What are the costs of opting not to vaccinate children? Who bears these costs: citizens or the government, or both the citizens and the government?

11. Does vaccination have an opportunity cost? Explain from the point of view of opponents and proponents of vaccination.

Multiple Choice Quiz

1. Which of the following describes the reason why scarcity exists?

    A. Governments make bad economic decisions.
    B. The gap between the rich and the poor is too wide.
    C. Wants exceed the resources available to satisfy them.
    D. There is too much unemployment.

2. Which of the following defines economics?
Economics is the social science that studies _____.

    A. the best way of eliminating scarcity
    B. the choices made to cope with scarcity, how incentives influence those choices, and how the choices are coordinated
    C. how money is created and used
    D. the inevitable conflict between self-interest and the social interest

3. Of the three big questions, *what, how*, and *for whom*, which of the following is an example of a *how* question?

    A. Why do doctors and lawyers earn high incomes?
    B. Why don't we produce more small cars and fewer gas guzzlers?
    C. Why do we use machines rather than migrant workers to pick grapes?
    D. Why do college football coaches earn more than professors?

4. Which of the following is not a key idea in the economic way of thinking?

    A. People make rational choices by comparing costs and benefits.
    B. Poor people are discriminated against and should be treated more fairly.
    C. A rational choice is made at the margin.
    D. Choices respond to incentives.

5. A rational choice is _____.

    A. the best thing you must forgo to get something
    B. what you are willing to forgo to get something
    C. made by comparing marginal benefit and marginal cost
    D. the best for society

6. Which of the following best illustrates your marginal benefit of studying?

    A. The knowledge you gain from studying two hours a night for a month
    B. The best things forgone by studying two hours a night for a month
    C. What you are willing to give up to study for one additional hour
    D. What you must give up to be able to study for one additional hour

7. The scientific method uses models to _____.

    A. clarify normative disagreements
    B. avoid the need to study real questions
    C. replicate all the features of the real world
    D. focus on those features of reality assumed relevant for understanding a cause-and-effect relationship

8. Which of the following is a positive statement?

    A. We should stop using corn to make ethanol because it is raising the cost of food.
    B. You will get the most out of college life if you play a sport once a week.
    C. Competition among wireless service providers across the borders of Canada, Mexico, and the United States has driven roaming rates down.
    D. Bill Gates ought to spend more helping to eradicate malaria in Africa

APPENDIX: MAKING AND USING GRAPHS

When you have completed your study of this appendix, you will be able to

1 Interpret graphs that display data.

2 Interpret the graphs used in economic models.

3 Define and calculate slope.

**4** Graph relationships among more than two variables.

Basic Idea

A graph represents a quantity as a distance and enables us to visualize the relationship between two variables. To make a graph, we set two lines called *axes* perpendicular to each other, like those in Figure A1.1. The vertical line is called the *y*-axis, and the horizontal line is called the *x*-axis. The common zero point is called the *origin*. In Figure A1.1, the *x*-axis measures temperature in degrees Fahrenheit. A movement to the right shows an increase in temperature, and a movement to the left shows a decrease in temperature. The *y*-axis represents ice cream consumption, measured in gallons per day.

To make a graph, we need a value of the variable on the *x*-axis and a corresponding value of the variable on the *y*-axis. For example, if the temperature is 40°F, ice cream consumption is 5 gallons a day at point *A* in Figure A1.1. If the temperature is 80°F, ice cream consumption is 20 gallons a day at point *B* in Figure A1.1. Graphs like that in Figure A1.1 can be used to show any type of quantitative data on two variables.

FIGURE A1.1

Making a Graph
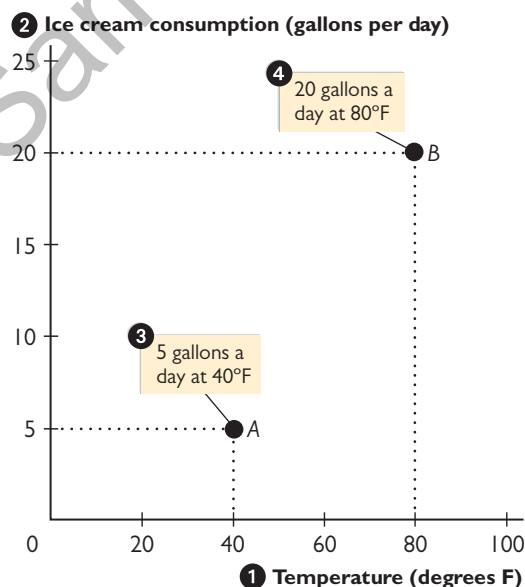
All graphs have axes that measure quantities as distances.

❶ The horizontal axis (*x*-axis) measures temperature in degrees Fahrenheit. A movement to the right shows an increase in temperature.

❷ The vertical axis (*y*-axis) measures ice cream consumption in gallons per day. A movement upward shows an increase in ice cream consumption.

❸ Point *A* shows that 5 gallons of ice cream are consumed on a day when the temperature is 40°F.

❹ Point *B* shows that 20 gallons of ice cream are consumed on a day when the temperature is 80°F.

■ Interpreting Data Graphs

Scatter diagram
A graph of the value of one variable against the value of another variable.

A **scatter diagram** is a graph of the value of one variable against the value of another variable. It is used to reveal whether a relationship exists between two variables and to describe the relationship. Figure A1.2 shows two examples.

Figure A1.2(a) shows the relationship between expenditure and income. Each point shows expenditure per person and income per person in the United States in a given year from 2000 to 2018. The points are "scattered" within the graph. The label on each point shows its year. The point marked 10 shows that in 2010, income per person was $36,522 and expenditure per person was $32,879. This scatter diagram reveals that as income increases, expenditure also increases.

Figure A1.2(b) shows the relationship during the 2010s between the average price of a smartphone and the number of smartphones in use in the United States. This scatter diagram reveals that as the average price of a smartphone falls, the number of smartphones in use increases.

Time-series graph
A graph that measures time on the *x*-axis and the variable or variables in which we are interested on the *y*-axis.

A **time-series graph** measures time (for example, months or years) on the *x*-axis and the variable or variables in which we are interested on the *y*-axis. Figure A1.2(c) shows an example. In this graph, time (on the *x*-axis) is measured in years, which run from 1980 to 2020. The variable that we are interested in is the price of coffee, and it is measured on the *y*-axis.

A time-series graph conveys an enormous amount of information quickly and easily, as this example illustrates. It shows when the value is
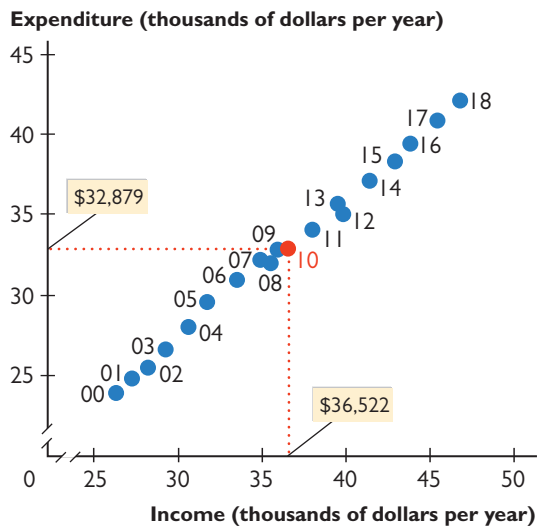
1. High or low. When the line is a long way from the *x*-axis, the price is high, as it was in 1986. When the line is close to the *x*-axis, the price is low, as it was in 2001.

2. Rising or falling. When the line slopes upward, as in 2006, the price is rising. When the line slopes downward, as in 1997, the price is falling.

3. Rising or falling quickly or slowly. If the line is steep, then the price is rising or falling quickly. If the line is not steep, the price is rising or falling slowly. For example, the price rose quickly in 2006 and slowly in 2014. The price fell quickly in 1987 and slowly in 1996.

Trend
A general tendency for the value of a variable to rise or fall over time.

A time-series graph also reveals whether the variable has a trend. A **trend** is a general tendency for the value of a variable to rise or fall over time. You can see that the price of coffee had a general tendency to fall from 1980 to 2020. That is, although the price rose and fell, it had a general tendency to fall.
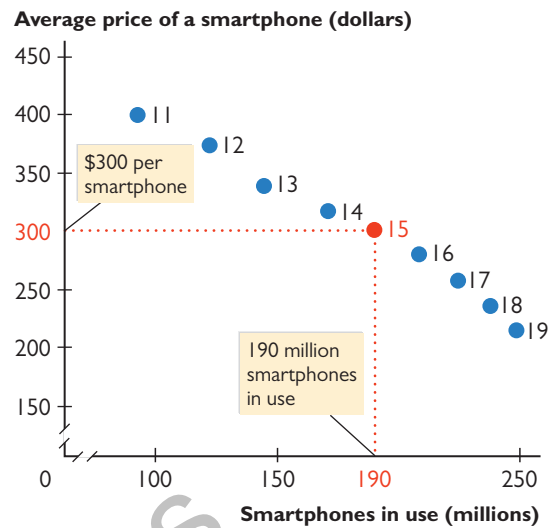
With a time-series graph, we can compare different periods quickly. Figure A1.2(c) shows that the 2000s were different from the 1990s, which in turn were different from the 1980s. The price of coffee started the 1980s high and then fell for a number of years. During the 1990s, the price was on a roller coaster. And during the 2000s, the price rose through 2011 before falling again. This graph conveys a wealth of information about the price of coffee, and it does so in much less space than we have used to describe only some of its features.

Cross-section graph
A graph that shows the values of an economic variable for different groups in a population at a point in time.

A **cross-section graph** shows the values of an economic variable for different groups in a population at a point in time. Figure A1.2(d) is an example of a cross-section graph. It shows the percentage of people who participate in selected sports activities in the United States. This graph uses bars rather than dots and lines, and the length of each bar indicates the participation rate. Figure A1.2(d) enables you to compare the participation rates in these ten sporting activities, and you can do so much more quickly and clearly than by looking at a list of numbers.
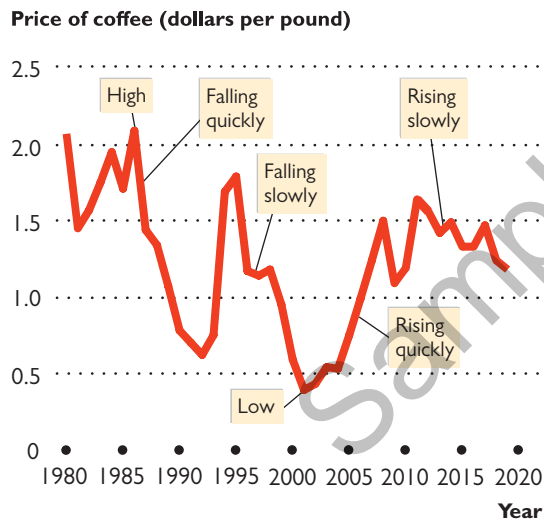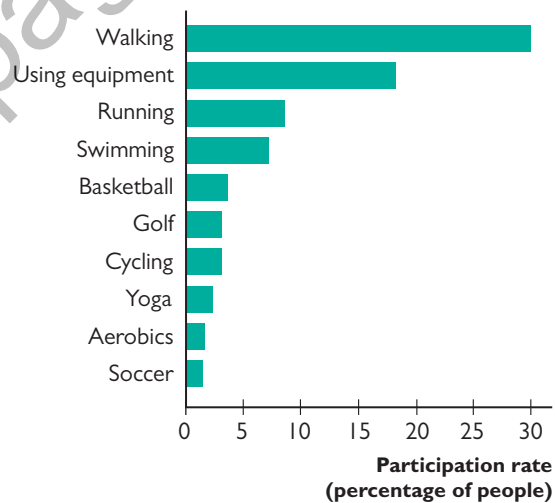
■ **FIGURE A1.2**

Data Graphs

Expenditure (thousands of dollars per year)

(a) Scatter Diagram: Expenditure and income

$32,879

$36,522

Income (thousands of dollars per year)

Average price of a smartphone (dollars)

$300 per smartphone

190 million smartphones in use

Smartphones in use (millions)

(b) Scatter Diagram: Subscribers and cost

Price of coffee (dollars per pound)

High

Falling quickly

Falling slowly

Rising slowly

Rising quickly

Low

Year

(c) Time Series: The price of coffee

Walking
Using equipment
Running
Swimming
Basketball
Golf
Cycling
Yoga
Aerobics
Soccer

Participation rate (percentage of people)

(d) Cross Section: Participation in selected sports activities

A scatter diagram reveals the relationship between two variables. In part (a), as income increases, expenditure almost always increases. In part (b), as the average price of a smartphone falls, the number of smartphones in use increases.

A time-series graph plots the value of a variable on the *y*-axis against time on the *x*-axis. Part (c) plots the price of coffee each

year from 1980 to 2020. The graph shows when the price of coffee was high and low, when it increased and decreased, and when it changed quickly and changed slowly.

A cross-section graph shows the value of a variable across the members of a population. Part (d) shows the participation rate in the United States in each of ten sporting activities.

■ Interpreting Graphs Used in Economic Models

We use graphs to show the relationships among the variables in an economic model. An *economic model* is a simplified description of the economy or of a component of the economy such as a business or a household. It consists of statements about economic behavior that can be expressed as equations or as curves in a graph. Economists use models to explore the effects of different policies or other influences on the economy in ways similar to those used to test model airplanes in wind tunnels and models of the climate.

Figure A1.3 shows graphs of the relationships between two variables that move in the same direction. Such a relationship is called a **positive relationship** or **direct relationship**.

Part (a) shows a straight-line relationship, which is called a **linear relationship**. The distance traveled in 5 hours increases as the speed increases. For example, point *A* shows that 200 miles are traveled in 5 hours at a speed of 40 miles an hour. And point *B* shows that the distance traveled in 5 hours increases to 300 miles if the speed increases to 60 miles an hour.

Part (b) shows the relationship between distance sprinted and recovery time (the time it takes the heart rate to return to its normal resting rate). An upward-sloping curved line that starts out quite flat but then becomes steeper as we move along the curve away from the origin describes this relationship. The curve slopes upward and becomes steeper because the extra recovery time needed from sprinting another 100 yards increases. It takes 5 minutes to recover from sprinting 100 yards but 15 minutes to recover from sprinting 200 yards.

Part (c) shows the relationship between the number of problems worked by a student and the amount of study time. An upward-sloping curved line that starts out quite steep and becomes flatter as we move away from the origin shows this

Positive relationship or **direct relationship**
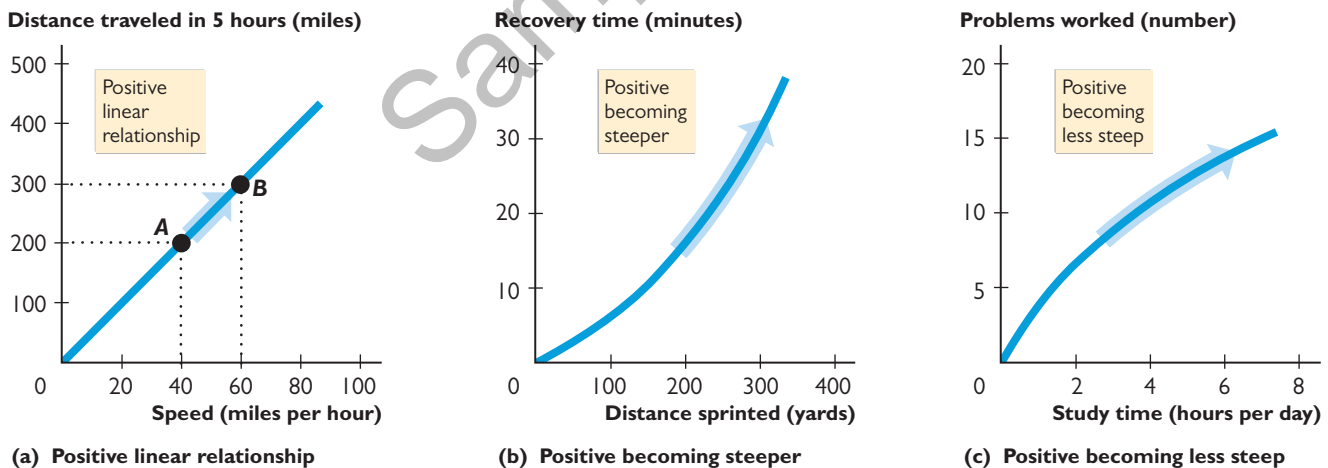A relationship between two variables that move in the same direction.

Linear relationship
A relationship that graphs as a straight line.

■ **FIGURE A1.3**

Positive (Direct) Relationships

(a) Positive linear relationship

(b) Positive becoming steeper

(c) Positive becoming less steep

Part (a) shows that as speed increases, the distance traveled in a given number of hours increases along a straight line.

Part (b) shows that as the distance sprinted increases, recovery time increases along a curve that becomes steeper.

Part (c) shows that as study time increases, the number of problems worked increases along a curve that becomes less steep.

relationship. Study time becomes less effective as you increase the hours worked and become more tired.

Figure A1.4 shows relationships between two variables that move in opposite directions. Such a relationship is called a **negative relationship** or **inverse relationship**.
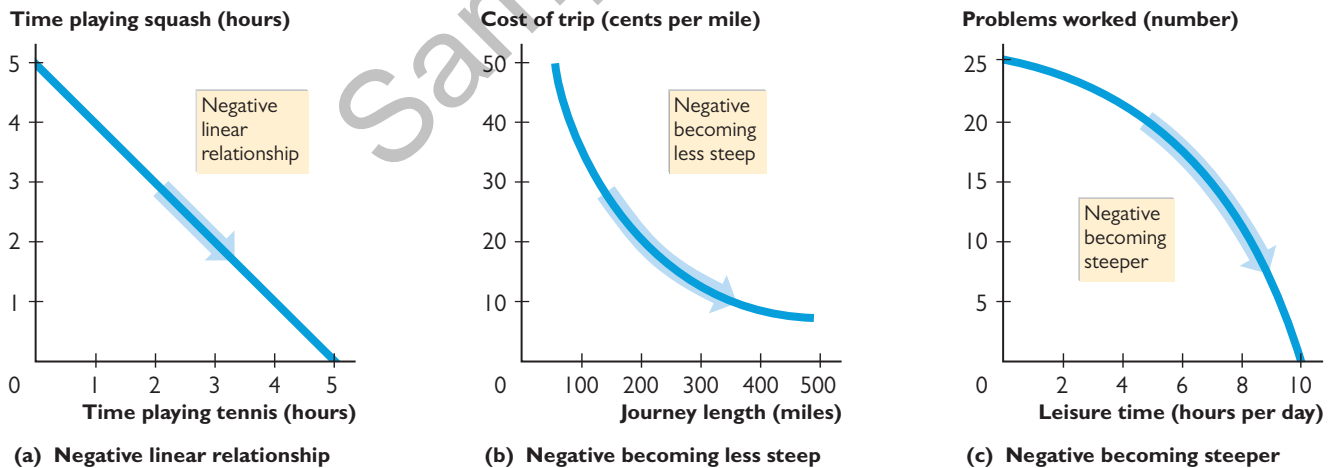
Part (a) shows the relationship between the number of hours spent playing squash and the number of hours spent playing tennis when the total number of hours available is five. One extra hour spent playing tennis means one hour less playing squash and vice versa. This relationship is negative and linear.

Part (b) shows the relationship between the cost per mile traveled and the length of a journey. The longer the journey, the lower is the cost per mile. But as the journey length increases, the fall in the cost per mile becomes smaller. This feature of the relationship is shown by the fact that the curve slopes downward, starting out steep at a short journey length and then becoming flatter as the journey length increases. This relationship arises because some of the costs, such as auto insurance, are fixed, and as the journey length increases, the fixed costs are spread over more miles.

Part (c) shows the relationship between the amount of leisure time and the number of problems worked by a student. Increasing leisure time produces an increasingly large reduction in the number of problems worked. This relationship is a negative one that starts out with a gentle slope at a small number of leisure hours and becomes steeper as the number of leisure hours increases. This relationship is a different view of the idea shown in Figure A1.3(c).

Many relationships in economic models have a maximum or a minimum. For example, firms try to make the largest possible profit and to produce at the lowest possible cost. Figure A1.5 shows relationships that have a maximum or a minimum.

Negative relationship or **inverse relationship**
A relationship between two variables that move in opposite directions.

■ **FIGURE A1.4**

Negative (Inverse) Relationships

(a) Negative linear relationship

(b) Negative becoming less steep

(c) Negative becoming steeper

Part (a) shows that as the time playing tennis increases, the time playing squash decreases along a straight line.
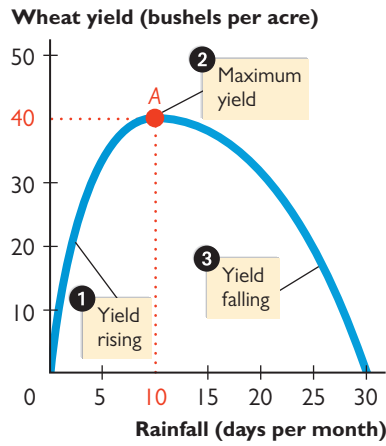
Part (b) shows that as the journey length increases, the cost of the trip falls along a curve that becomes less steep.

Part (c) shows that as leisure time increases, the number of problems worked decreases along a curve that becomes steeper.
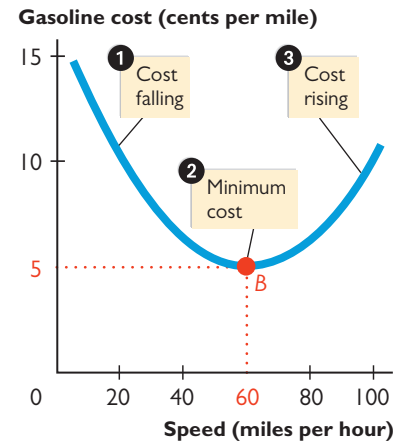
Maximum and Minimum Points

In part (a), as the rainfall increases, the curve ❶ slopes upward as the yield per acre rises, ❷ is flat at point *A*, the maximum yield, and then ❸ slopes downward as the yield per acre falls.

In part (b), as the speed increases, the curve ❶ slopes downward as the cost per mile falls, ❷ is flat at the minimum point *B*, and then ❸ slopes upward as the cost per mile rises.

Wheat yield (bushels per acre)

❷ Maximum yield

❶ Yield rising

❸ Yield falling

Rainfall (days per month)

(a) Relationship with a maximum

Gasoline cost (cents per mile)

❶ Cost falling

❸ Cost rising

❷ Minimum cost

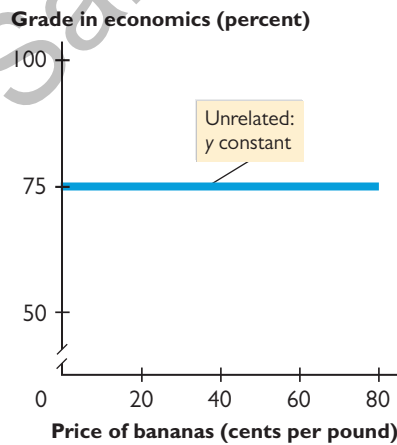**Speed (miles per hour)**

(b) Relationship with a minimum

Part (a) shows a relationship that starts out sloping upward, reaches a maximum, and then slopes downward. Part (b) shows a relationship that begins sloping downward, falls to a minimum, and then slopes upward.

Finally, there are many situations in which, no matter what happens to the value of one variable, the other variable remains constant. Sometimes we want to show two variables that are unrelated in a graph. Figure A1.6 shows two graphs in which the variables are unrelated.
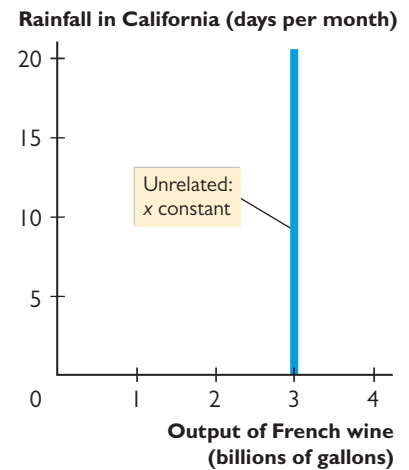
Variables That Are Unrelated

In part (a), as the price of bananas increases, the student's grade in economics remains at 75 percent. These variables are unrelated, and the curve is horizontal.

In part (b), the vineyards of France produce 3 billion gallons of wine no matter what the rainfall is in California. These variables are unrelated, and the curve is vertical.

Grade in economics (percent)

Unrelated: *y* constant

Price of bananas (cents per pound)

(a) Unrelated: *y* constant

Rainfall in California (days per month)

Unrelated: *x* constant

Output of French wine (billions of gallons)

(b) Unrelated: *x* constant

■ The Slope of a Relationship

We can measure the influence of one variable on another by the slope of the relationship. The **slope** of a relationship is the change in the value of the variable measured on the y-axis divided by the change in the value of the variable measured on the x-axis. We use the Greek letter Δ (delta) to represent "change in." So Δy means the change in the value of y, and Δx means the change in the value of x. The slope of the relationship is

$$\Delta y \div \Delta x.$$

If a large change in y is associated with a small change in x, the slope is large and the curve is steep. If a small change in y is associated with a large change in x, the slope is small and the curve is flat.
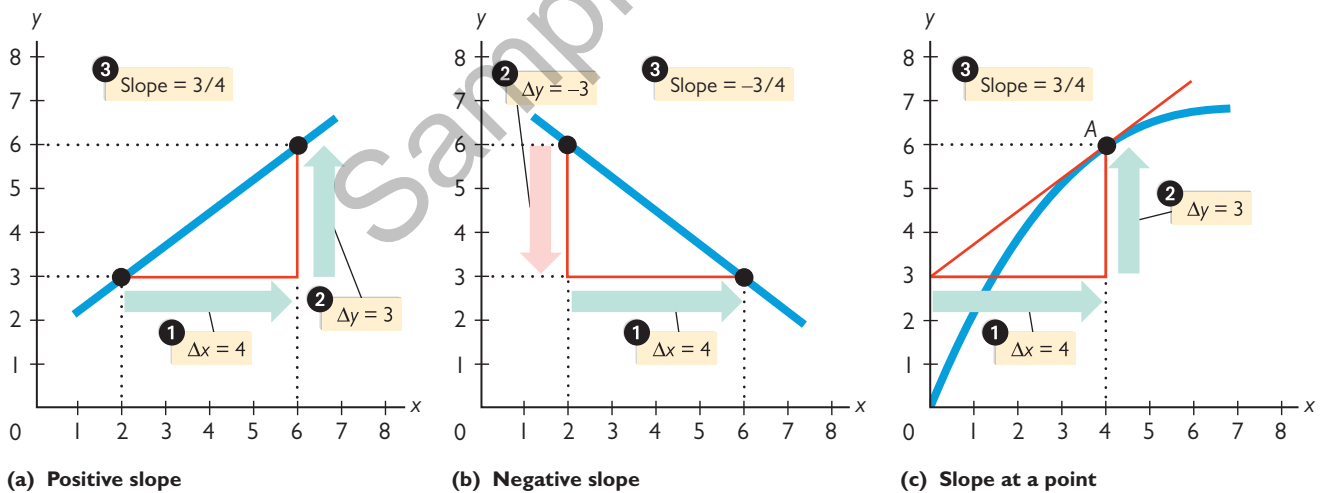
Figure A1.7 shows you how to calculate slope. The slope of a straight line is the same regardless of where on the line you calculate it—the slope is constant. In part (a), when x increases from 2 to 6, y increases from 3 to 6. The change in x is 4—that is, Δx is 4. The change in y is 3—that is, Δy is 3. The slope of that line is 3/4. In part (b), when x increases from 2 to 6, y *decreases* from 6 to 3. The change in y is *minus* 3—that is, Δy is -3. The change in x is plus 4—that is, Δx is 4. The slope of the curve is $-3/4$.

In part (c), we calculate the slope at a point on a curve. To do so, place a ruler on the graph so that it touches point A and no other point on the curve, then draw a straight line along the edge of the ruler. The slope of this straight line is the slope of the curve at point A. This slope is 3/4.

Slope

The change in the value of the variable measured on the y-axis divided by the change in the value of the variable measured on the x-axis.

■ **FIGURE A1.7**

Calculating Slope

(a) Positive slope

(b) Negative slope

(c) Slope at a point

In part (a), ❶ when Δx is 4, ❷ Δy is 3, so ❸ the slope ($\Delta y \div \Delta x$) is 3/4.

In part (b), ❶ when Δx is 4, ❷ Δy is -3, so ❸ the slope ($\Delta y \div \Delta x$) is $-3/4$.

In part (c), the slope of the curve at point A equals the slope of the red line. ❶ When Δx is 4, ❷ Δy is 3, so ❸ the slope ($\Delta y \div \Delta x$) is 3/4.

■ Relationships Among More Than Two Variables

All the graphs that you have studied so far plot the relationship between two variables as a point formed by the x and y values. But most of the relationships in economics involve relationships among many variables, not just two. For example, the amount of ice cream consumed depends on the price of ice cream and the temperature. If ice cream is expensive and the temperature is low, people eat much less ice cream than when ice cream is inexpensive and the temperature is high. For any given price of ice cream, the quantity consumed varies with the temperature; and for any given temperature, the quantity of ice cream consumed varies with its price.

Figure A1.8 shows a relationship among three variables. The table shows the number of gallons of ice cream consumed per day at various temperatures and ice cream prices. How can we graph these numbers?

To graph a relationship that involves more than two variables, we use the *ceteris paribus* assumption.

Ceteris Paribus

The Latin phrase *ceteris paribus* means "other things remaining the same." Every laboratory experiment is an attempt to create *ceteris paribus* and isolate the relationship of interest. We use the same method to make a graph.

Figure A1.8(a) shows an example. This graph shows what happens to the quantity of ice cream consumed when the price of ice cream varies while the temperature remains constant. The curve labeled 90°F shows the relationship between ice cream consumption and the price of ice cream if the temperature is 90°F. The numbers used to plot that curve are those in the first and fifth columns of the table in Figure A1.8. For example, if the temperature is 90°F, 10 gallons of ice cream are consumed when the price is $3.25 a scoop.

We can also show the relationship between ice cream consumption and temperature while the price of ice cream remains constant, as shown in Figure A1.8(b). The curve labeled $3.25 shows how the consumption of ice cream varies with the temperature when the price of ice cream is $3.25 a scoop. The numbers used to plot that curve are those in the sixth row of the table in Figure A1.8. For example, at $3.25 a scoop, 10 gallons of ice cream are consumed when the temperature is 90°F.

Figure A1.8(c) shows the effect of a change in temperature on the relationship between the quantity of ice cream consumed and the price of ice cream. The blue curve labeled 90°F is the same as the curve in Figure A1.8(a). It is the relationship between the price of ice cream and the quantity consumed on a hot day. The red curve labeled 70°F shows the relationship between the price of ice cream and the quantity consumed on a cooler day when the temperature is 70°F.

On each curve in Figure A1.8(c), "other things remain the same" as the price of ice cream and the quantity consumed change. When other things don't remain the same and the termperature changes, the relationship between the price of ice cream and the quantity consumed changes and the curve shifts. You will encounter this type of shifting relationship at many points in your economics course.
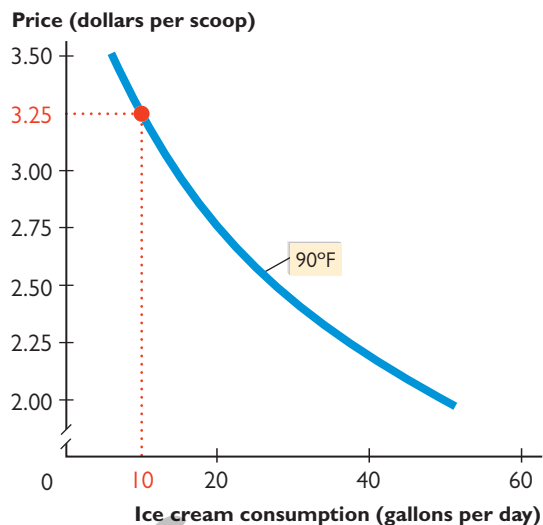
With what you've learned about graphs in this Appendix, you can move forward with your study of economics. There are no graphs in this textbook that are more complicated than the ones you've studied here.

■ **FIGURE A1.8**

Graphing a Relationship Among Three Variables

Price (dollars per scoop)	Ice cream consumption (gallons per day)			
	30°F	**50°F**	**70°F**	**90°F**
2.00	12	18	25	50
2.25	10	12	18	37
2.50	7	10	13	27
2.75	5	7	10	20
3.00	3	5	7	14
3.25	2	3	5	**10**
3.50	1	2	3	6

(a) Price and consumption at a given temperature
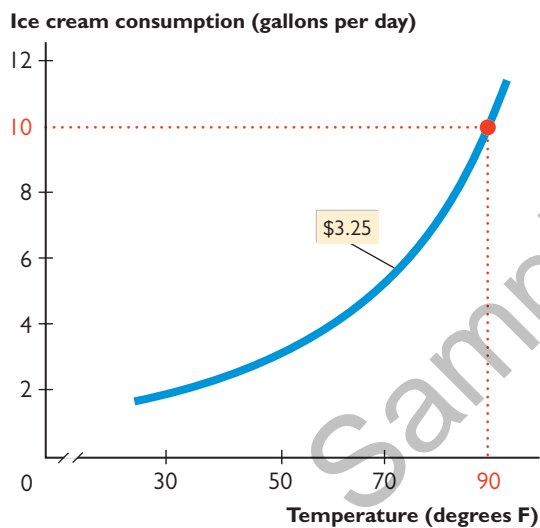
(b) Temperature and consumption of ice cream at a given price
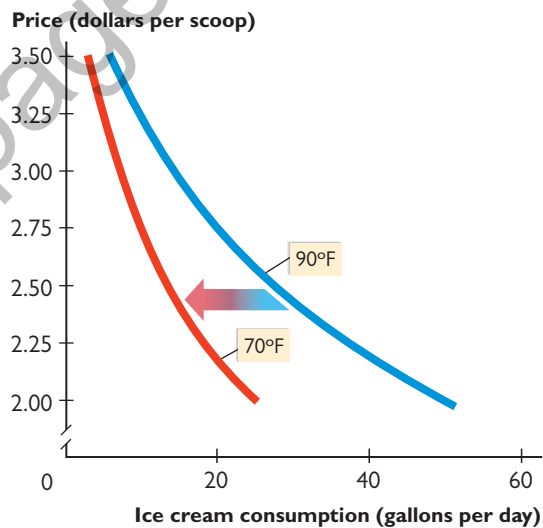
(c) A change in temperature shifts the curve

The table shows the quantity of ice cream consumed at different prices and different temperatures. For example, if the price is $3.25 a scoop and the temperature is 90°F, 10 gallons of ice cream are consumed. This set of values is highlighted in the table and in parts (a) and (b).

Part (a) shows the relationship between the price and consumption when the temperature is 90°F. The negative slope means that a higher price brings lower consumption.

Part (b) shows the relationship between the temperature and consumption when price is $3.25 a scoop. The positive slope means that a higher temperature brings greater consumption

Part (c) shows the change in the relationship between price and consumption when the temperature falls from 90°F to 70°F.

TABLE 1

	A	B	C	D
1	2007	500	28	2
2	2009	297	12	10
3	2011	241	8	25
4	2013	174	5	50
5	2015	117	4	75
6	2017	88	2	125

TABLE 2

x	0	1	2	3	4	5
y	32	31	28	23	16	7

TABLE 3

Price (dollars per ride)	Balloon rides (number per day)		
	50°F	70°F	90°F
5	32	50	40
10	27	40	32
15	18	32	27
20	10	27	18

TABLE 4

x	0	1	2	3	4	5
y	0	1	4	9	16	25

TABLE 5

Price (dollars per cup)	Hot chocolate (cups per week)		
	50°F	70°F	90°F
2.00	40	30	20
2.50	30	20	10
3.00	20	10	0
3.50	10	0	0

APPENDIX CHECKPOINT

Problems and Applications

The spreadsheet in Table 1 provides data on the U.S. economy: Column A is the year; the other columns are quantities sold in millions per year of compact discs (column B), music videos (column C), and video streaming (column D). Use this spreadsheet to work Problems **1** and **2**.

1. Draw a scatter diagram to show the relationship between quantities sold of compact discs and singles downloads. Describe the relationship.
2. Draw a time-series graph of the quantity of singles downloads. Say in which year or years the quantity of singles downloaded (a) was highest, (b) was lowest, (c) increased the most, and (d) increased the least. If the data show a trend, describe it.
3. Is the relationship between x and y in Table 2 positive or negative? Calculate the slope of the relationship when x equals 2 and when x equals 4. How does the slope change as the value of x increases?
4. Table 3 provides data on the price of a balloon ride, the temperature, and the number of rides a day. Draw graphs to show the relationship between
   • The price and the number of rides, when the temperature is 70°F.
   • The number of rides and the temperature, when the price is $15 a ride.

Additional Problems and Applications

Use the information in Table 1 to work Problems **1** and **2**.

1. Draw a scatter diagram to show the relationship between quantities sold of music videos and video streaming. Describe the relationship.
2. Draw a time-series graph of the quantity of music videos sold. Say in which year or years the quantity sold (a) was highest, (b) was lowest, (c) decreased the most, and (d) decreased the least. If the data show a trend, describe it.

Use the information in Table 4 on the relationship between two variables x and y to work Problems **3** and **4**.

3. Is the relationship between x and y in Table 4 positive or negative? Explain.
4. Calculate the slope of the relationship when x equals 2 and when x equals 4. How does the slope change as the value of x increases?
5. Table 5 provides data on the price of hot chocolate, the temperature, and the cups of hot chocolate bought. Draw graphs to show the relationship between
   • The price and cups of hot chocolate bought, when the temperature is constant.
   • The temperature and cups of hot chocolate bought, when the price is constant.

Key Terms

Cross-section graph, 62
Direct relationship, 64
Inverse relationship, 65
Linear relationship, 64

Negative relationship, 65
Positive relationship, 64
Scatter diagram, 62
Slope, 67

Time-series graph, 62
Trend, 62