Economics by Example:
What's to Love About Economics?

# Basic Economic Concepts

One must choose!

Common Ground

The annual meeting of the American Economic Association draws thousands of economists, young and old, famous and obscure. There are booksellers, business meetings, and quite a few job interviews. But mainly the economists gather to talk and listen. During the busiest times, 60 or more presentations may be taking place simultaneously, on questions that range from the future of the stock market to who does the cooking in two-earner families.

What do these people have in common? An expert on the stock market probably knows very little about the economics of housework, and vice versa. Yet an economist who wanders into the wrong seminar and ends up listening to presentations on some unfamiliar topic is nonetheless likely to hear much that is familiar. The reason is that all economic analysis is based on a set of common principles that apply to many different issues.

Some of these principles involve *individual choice*—for economics is, first of all, about the choices that individuals make. Do you choose to work during the summer or take a backpacking trip? Do you download a new album or go to a movie? These decisions involve *making a choice* from among a limited number
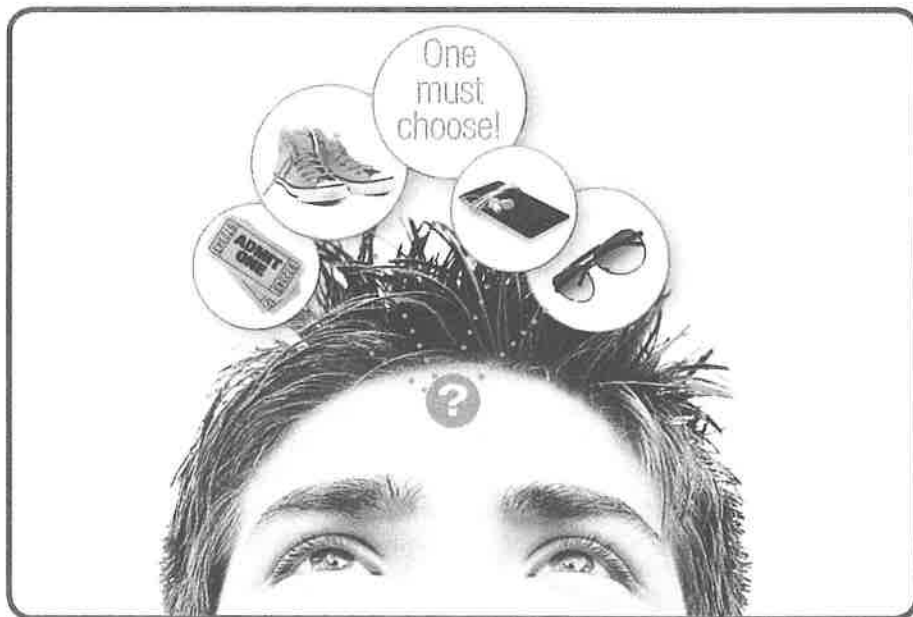
of alternatives—limited because no one can have everything that he or she wants. Every question in economics at its most basic level involves individuals making choices.

But to understand how an economy works, you need to understand more than how individuals make choices. None of us lives like Robinson Crusoe, alone on an island—we must make decisions in an environment that is shaped by the decisions of others. Indeed, in our global economy even the simplest decisions you make—say, what to have for breakfast— are shaped by the decisions of thousands of other people, from the banana grower in Costa Rica who decided to grow the fruit you eat to the farmer in Iowa who provided the corn in your cornflakes. And because each one of us depends on so many others—and they, in turn, depend on us—our choices interact. So, although all economics at a basic level is about individual choice, in order to understand

behavior within an economy we must also understand economic *interaction*—how my choices affect your choices, and vice versa.

Many important economic interactions can be understood by looking at the markets for individual goods—for example, the market for corn. But we must also understand economy-wide interactions in order to understand how they can lead to the ups and downs we see in the economy as a whole.

In this section we discuss the study of economics and the difference between microeconomics and macroeconomics. We also introduce the major topics within macroeconomics and the use of models to study the macroeconomy. Finally, we present the production possibilities curve model and use it to understand basic economic activity, including trade between two economies. Because the study of economics relies on graphical models, an appendix on the use of graphs follows the end of this section.

MODULE 1

The Study of Economics

In this Module, you will learn to:

- Explain how scarcity and choice are central to the study of economics
- Discuss the importance of opportunity cost in individual choice and decision making
- Explain the difference between positive economics and normative economics
- Identify areas of agreement and disagreement among economists
- Distinguish between microeconomic concepts and macroeconomic concepts

Individual Choice: The Core of Economics

Economics is the study of scarcity and choice.

Individual choice is decisions by individuals about what to do, which necessarily involve decisions about what not to do.

An **economy** is a system for coordinating a society's productive and consumptive activities.

In a **market economy**, the decisions of individual producers and consumers largely determine what, how, and for whom to produce, with little government involvement in the decisions.

In a **command economy**, industry is publicly owned and a central authority makes production and consumption decisions.

Economics is the study of scarcity and choice. Every economic issue involves, at its most basic level, **individual choice**—decisions by individuals about what to do and what *not* to do. In fact, you might say that it isn't economics if it isn't about choice.

Step into a big store such as Walmart or Target. There are thousands of different products available, and it is extremely unlikely that you—or anyone else—could afford to buy everything you might want to have. Besides, there's only so much space in your room. Given the limitations on your budget and your living space, you must choose which products to buy and which to leave on the shelf.

The fact that those products are on the shelf in the first place involves choice—the store manager chose to put them there, and the manufacturers of the products chose to produce them. The **economy** is a system that coordinates choices about production with choices about consumption, and distributes goods and services to the people who want them. The United States has a **market economy**, in which production and consumption are the result of decentralized decisions by many firms and individuals. There is no central authority telling people what to produce or where to ship it. Each individual producer makes what he or she thinks will be most profitable, and each consumer buys what he or she chooses.

An alternative to a market economy is a **command economy**, in which industry is publicly owned and there *is* a central authority making production and consumption decisions. Command economies have been tried, most notably in the Soviet Union between 1917 and 1991, but they didn't work very well. Producers in the Soviet Union

routinely found themselves unable to produce because they did not have crucial raw materials, or they succeeded in producing but then found that nobody wanted what the central authority had them produce. Consumers were often unable to find necessary items—command economies are famous for long lines at shops.

At the root of the problem with command economies is a lack of **incentives**, which are rewards or punishments that motivate particular choices. In market economies, producers are free to charge higher prices when there is a shortage of something, and to keep the resulting profits. High prices and profits provide incentives for producers to make more of the most-needed goods and services and to eliminate shortages.

In fact, economists tend to be skeptical of any attempt to change people's behavior that doesn't change their incentives. For example, a plan that calls on manufacturers to reduce pollution voluntarily probably won't be effective; a plan that gives them a financial incentive to do so is more likely to succeed.

Property rights, which establish ownership and grant individuals the right to trade goods and services with each other, create many of the incentives in market economies. With the right to own property comes the incentive to produce things of value, either to keep, or to trade for mutual gain. And ownership creates an incentive to put resources to their best possible use. Property rights to a lake, for example, give the owners an incentive not to pollute that lake if its use for recreation, serenity, or sale has greater value.

In any economy, the decisions of what to do with the next ton of pollution, the next hour of free time, and the next dollar of spending money are *marginal decisions*. They involve trade-offs at the margin: comparing the costs and benefits of doing a little bit more of an activity versus a little bit less. The gain from doing something one more time is called the *marginal benefit*. The cost of doing something one more time is the *marginal cost*. If the marginal benefit of making another car, reading another page, or buying another latte exceeds the marginal cost, the activity should continue. Otherwise, it should not. The study of such decisions, known as **marginal analysis**, plays a central role in economics because the formula of doing things until the marginal benefit no longer exceeds the marginal cost is the key to deciding "how much" to do of any activity.

All economic activities involve individual choice. Let's take a closer look at what this means for the study of economics.

Resources Are Scarce

You can't always get what you want. Almost everyone would like to have a beautiful house in a great location (and help with the housecleaning), two or three luxury cars, and frequent vacations in fancy hotels. But even in a rich country like the United States, not many families can afford all of that. So they must make choices—whether to go to Disney World this year or buy a better car, whether to make do with a small backyard or accept a longer commute in order to live where land is cheaper.

Limited income isn't the only thing that keeps people from having everything they want. Time is also in limited supply: there are only 24 hours in a day. And because the time we have is limited, choosing to spend time on one activity also means choosing not to spend time on a different activity—spending time studying for an exam means forgoing a night at the movies. Indeed, many people feel so limited by the number of hours in the day that they are willing to trade money for time. For example, convenience stores usually charge higher prices than larger supermarkets. But they fulfill a valuable role by catering to customers who would rather pay more than spend the time traveling farther to a supermarket where they might also have to wait in longer lines.

Why do individuals have to make choices? The ultimate reason is that *resources are scarce*. A **resource** is anything that can be used to produce something else. The economy's resources, sometimes called *factors of production,* can be classified into four categories: **land** (including timber, water, minerals, and all other resources that come from nature), **labor** (the effort of workers), **capital** (machinery, buildings, tools, and all other manufactured goods used to make other goods and services), and **entrepreneurship** (risk taking, innovation, and the organization of resources for production). A resource is **scarce**

Incentives are rewards or punishments that motivate particular choices.

Property rights establish ownership and grant individuals the right to trade goods and services with each other.

Marginal analysis is the study of the costs and benefits of doing a little bit more of an activity versus a little bit less.

A **resource** is anything that can be used to produce something else.

Land refers to all resources that come from nature, such as minerals, timber, and petroleum.

Labor is the effort of workers.

Capital refers to manufactured goods used to make other goods and services.

Entrepreneurship describes the efforts of entrepreneurs in organizing resources for production, taking risks to create new enterprises, and innovating to develop new products and production processes.

A **scarce** resource is not available in sufficient quantities to satisfy all the various ways a society wants to use it.

AP® Exam Tip

Students of microeconomics should pay close attention to *marginal analysis,* as it is often tested on the AP® exam. Any time you see "additional," think "marginal."

AP® Exam Tip

Be careful when you see key terms you think you already know, because economists have special meanings for many terms. For example, *scarcity* is about more than just a limited amount of a good. For an economist, scarcity involves trying to satisfy unlimited consumer wants with limited resources. The difference is the relationship to unlimited consumer wants.

The real cost of an item is its **opportunity cost**: what you must give up in order to get it.

Charles D. Winters

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LeBron James understood the concept of opportunity cost.

when there is not enough of it available to satisfy the various ways a society wants to use it. For example, there are limited supplies of oil and coal, which currently provide most of the energy used to produce and deliver everything we buy. And in a growing world economy with a rapidly increasing human population, even clean air and water have become scarce resources.

Just as individuals must make choices, the scarcity of resources means that society as a whole must make choices. One way for a society to make choices is simply to allow them to emerge as the result of many individual choices. For example, there are only so many hours in a week, and Americans must decide how to spend their time. How many hours will they spend going to supermarkets to get lower prices rather than saving time by shopping at convenience stores? The answer is the sum of individual decisions: each of the millions of individuals in the economy makes his or her own choice about where to shop, and society's choice is simply the sum of those individual decisions.

For various reasons, there are some decisions that a society decides are best not left to individual choice. For example, two of the authors of this book live in an area that until recently was mainly farmland but is now being rapidly built up. Most local residents feel that the community would be a more pleasant place to live if some of the land were left undeveloped. But no individual has an incentive to keep his or her land as open space, rather than sell it to a developer. So a trend has emerged in many communities across the United States of local governments purchasing undeveloped land and preserving it as open space. Decisions about how to use scarce resources are often best left to individuals, but sometimes should be made at a higher, community-wide, level.

Opportunity Cost: The Real Cost of Something Is What You Must Give Up to Get It

Suppose it is the last term before you graduate from high school and you must decide which college to attend. You have narrowed your choices to a small liberal arts college near home or a large state university several hours away. If you decide to attend the local liberal arts college, what is the cost of that decision? Of course, you will have to pay for tuition, books, and housing no matter which college you choose. Added to the cost of choosing the local college is the forgone opportunity to attend the large state university, your next best alternative. Economists call the value of what you must give up when you make a particular choice an **opportunity cost.**

Opportunity costs are crucial to individual choice because, in the end, all costs are opportunity costs. That's because with every choice, an alternative is forgone—money or time spent on one thing can't be spent on another. If you spend $15 on a pizza, you forgo the opportunity to spend that $15 on a steak. If you spend Saturday afternoon at the park, you can't spend Saturday afternoon doing homework. And if you attend one school, you can't attend another.

The park and school examples show that economists are concerned with more than just costs paid in dollars and cents. The forgone opportunity to do homework has no direct monetary cost, but it is an opportunity cost nonetheless. And if the local college and the state university have the same tuition and fees, the cost of choosing one school over the other has nothing to do with payments and everything to do with forgone opportunities.

Now suppose tuition and fees at the state university are $5,000 less than at the local college. In that case, what you give up to attend the local college is the ability to attend the state university *plus* the enjoyment you could have gained from spending $5,000 on other things. So the opportunity cost of a choice includes all the costs—whether or not they are monetary costs—of making that choice.

The choice to go to college *at all* provides an important final example of opportunity costs. High school graduates can either go to college or seek immediate employment. Even with a full scholarship that would make college "free" in terms of monetary costs, going to college would still be an expensive proposition because most young people,

if they were not in college, would have a job. By going to college, students forgo the income they could have earned if they had gone straight to work instead. Therefore, the opportunity cost of attending college is the value of all necessary monetary payments for tuition and fees *plus* the forgone income from the best available job that could take the place of going to college.

For most people the value of a college degree far exceeds the value of alternative earnings, with notable exceptions. The opportunity cost of going to college is high for people who could earn a lot during what would otherwise be their college years. Basketball star LeBron James bypassed college because the opportunity cost would have included his $13 million contract with the Cleveland Cavaliers and even more from corporate sponsors Nike and Coca-Cola. Facebook co-founder Mark Zuckerberg, Microsoft co-founder Bill Gates, and actor Matt Damon are among the high achievers who decided that the opportunity cost of completing college was too much to swallow.

Microeconomics Versus Macroeconomics

We have presented economics as the study of choices and described how, at its most basic level, economics is about individual choice. The branch of economics concerned with how individuals make decisions and how those decisions interact is called **microeconomics**. Microeconomics focuses on choices made by individuals, households, or firms—the smaller parts that make up the economy as a whole.

Macroeconomics focuses on the bigger picture—the overall ups and downs of the economy. When you study macroeconomics, you learn how economists explain these fluctuations and how governments can use economic policy to minimize the damage they cause. Macroeconomics focuses on **economic aggregates**—economic measures such as the unemployment rate, the inflation rate, and gross domestic product—that summarize data across many different markets.

Table 1.1 lists some typical questions that involve economics. A microeconomic version of the question appears on the left, paired with a similar macroeconomic question on the right. By comparing the questions, you can begin to get a sense of the difference between microeconomics and macroeconomics.

Microeconomics is the study of how individuals, households, and firms make decisions and how those decisions interact.

Macroeconomics is concerned with the overall ups and downs of the economy.

Economic aggregates are economic measures that summarize data across many different markets.

Table 1.1	Microeconomic Versus Macroeconomic Questions
Microeconomic Questions	**Macroeconomic Questions**
Should I go to college or get a job after high school?	How many people are employed in the economy as a whole this year?
What determines the salary that Citibank offers to a new college graduate?	What determines the overall salary levels paid to workers in a given year?
What determines the cost to a high school of offering a new course?	What determines the overall level of prices in the economy as a whole?
What government policies should be adopted to make it easier for low-income students to attend college?	What government policies should be adopted to promote employment and growth in the economy as a whole?
What determines the number of iPhones exported to France?	What determines the overall trade in goods, services, and financial assets between the United States and the rest of the world?

As these questions illustrate, microeconomics focuses on how individuals and firms make decisions, and the consequences of those decisions. For example, a school will use microeconomics to determine how much it would cost to offer a new course, which includes the instructor's salary, the cost of class materials, and so on. By weighing the costs and benefits, the school can then decide whether or not to offer the course. Macroeconomics, in contrast, examines the *overall* behavior of the economy—how the actions of all of the individuals and firms in the economy interact to produce a particular economy-wide level of economic performance. For example,

macroeconomics is concerned with the general level of prices in the economy and how high or low they are relative to prices last year, rather than with the price of a particular good or service.

Positive Versus Normative Economics

Economic analysis, as we will see throughout this book, draws on a set of basic economic principles. But how are these principles applied? That depends on the purpose of the analysis. Economic analysis that is used to answer questions about the way the economy works, questions that have definite right and wrong answers, is known as **positive economics**. In contrast, economic analysis that involves saying how the economy *should* work is known as **normative economics**.

Imagine that you are an economic adviser to the governor of your state and the governor is considering a change to the toll charged along the state turnpike. Below are three questions the governor might ask you.

1. How much revenue will the tolls yield next year?
2. How much would that revenue increase if the toll were raised from $1.00 to $1.50?
3. Should the toll be raised, bearing in mind that a toll increase would likely reduce traffic and air pollution near the road but impose some financial hardship on frequent commuters?

There is a big difference between the first two questions and the third one. The first two are questions about facts. Your forecast of next year's toll revenue without any increase will be proved right or wrong when the numbers actually come in. Your estimate of the impact of a change in the toll is a little harder to check—the increase in revenue depends on other factors besides the toll, and it may be hard to disentangle the causes of any change in revenue. Still, in principle there is only one right answer.

But the question of whether or not tolls should be raised may not have a "right" answer—two people who agree on the effects of a higher toll could still disagree about whether raising the toll is a good idea. For example, someone who lives near the turnpike but doesn't commute on it will care a lot about noise and air pollution but not so much about commuting costs. A regular commuter who doesn't live near the turnpike will have the opposite priorities.

This example highlights a key distinction between the two roles of economic analysis and presents another way to think about the distinction between positive and normative analysis: positive economics is about description, and normative economics is about prescription. Positive economics occupies most of the time and effort of economists.

Looking back at the three questions the governor might ask, it is worth noting a subtle but important difference between questions 1 and 2. Question 1 asks for a simple prediction about next year's revenue—a forecast. Question 2 is a "what if" question, asking how revenue would change if the toll were to increase. Economists are often called upon to answer both types of questions. Economic *models*, which provide simplified representations of reality using, for example, graphs or equations, are especially useful for answering "what if" questions.

The answers to such questions often serve as a guide to policy, but they are still predictions, not prescriptions. That is, they tell you what will happen if a policy is changed, but they don't tell you whether or not that result is good. Suppose that your economic model tells you that the governor's proposed increase in highway tolls will raise property values in communities near the road but will tax or inconvenience people who currently use the turnpike to get to work. Does that information make this proposed toll increase a good idea or a bad one? It depends on whom you ask. As we've just seen, someone who is very concerned with the communities near the road will support the increase, but

Should the toll be raised?

Positive economics is the branch of economic analysis that describes the way the economy actually works.

Normative economics makes prescriptions about the way the economy should work.

someone who is very concerned with the welfare of drivers will feel differently. That's a value judgment—it's not a question of positive economic analysis.

Still, economists often do engage in normative economics and give policy advice. How can they do this when there may be no "right" answer? One answer is that economists are also citizens, and we all have our opinions. But economic analysis can often be used to show that some policies are clearly better than others, regardless of individual opinions.

Suppose that policies A and B achieve the same goal, but policy A makes everyone better off than policy B—or at least makes some people better off without making other people worse off. Then A is clearly more beneficial than B. That's not a value judgment: we're talking about how best to achieve a goal, not about the goal itself.

For example, two different policies have been used to help low-income families obtain housing: rent control, which limits the rents landlords are allowed to charge, and rent subsidies, which provide families with additional money with which to pay rent. Almost all economists agree that subsidies are the preferable policy. (In a later module we'll see why this is so.) And so the great majority of economists, whatever their personal politics, favor subsidies over rent control.

When policies can be clearly ranked in this way, then economists generally agree. But it is no secret that economists sometimes disagree.

When and Why Economists Disagree

Economists have a reputation for arguing with each other. Where does this reputation come from? One important answer is that media coverage tends to exaggerate the real differences in views among economists. If nearly all economists agree on an issue—for example, the proposition that rent controls lead to housing shortages—reporters and editors are likely to conclude that there is no story worth covering, and so the professional consensus tends to go unreported. But when there is some issue on which prominent economists take opposing sides—for example, whether cutting taxes right now would help the economy—that does make a good news story. So you hear much more about the areas of disagreement among economists than you do about the many areas of agreement.

It is also worth remembering that economics, unavoidably, is often tied up in politics. On a number of issues, powerful interest groups know what opinions they want to hear. Therefore, they have an incentive to find and promote economists who profess those opinions, which gives these economists a prominence and visibility out of proportion to their support among their colleagues.

Although the appearance of disagreement among economists exceeds the reality, it remains true that economists often *do* disagree about important things. For example, some highly respected economists argue vehemently that the U.S. government should replace the income tax with a *value-added tax* (a national sales tax, which is the main source of government revenue in many European countries). Other equally respected economists disagree. What are the sources of this difference of opinion?

One important source of differences is in values: as in any diverse group of individuals, reasonable people can differ. In comparison to an income tax, a value-added tax typically falls more heavily on people with low incomes. So an economist who values a society with more social and income equality will likely oppose a value-added tax. An economist with different values will be less likely to oppose it.

A second important source of differences arises from the way economists conduct economic analysis. Economists base their conclusions on models formed by making simplifying assumptions about reality. Two economists can legitimately disagree about which simplifications are appropriate—and therefore arrive at different conclusions.
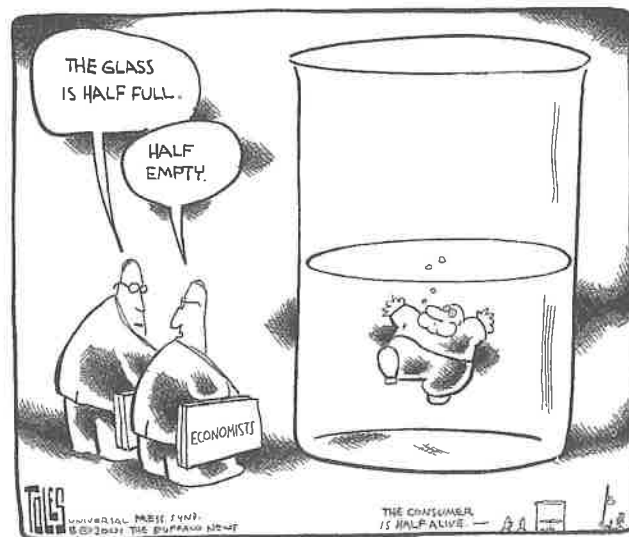
FYI | When Economists Agree

"If all the economists in the world were laid end to end, they still couldn't reach a conclusion." So goes one popular economist joke. But do economists really disagree that much?

Not according to a classic survey of members of the American Economic Association, reported in the May 1992 issue of the *American Economic Review*. The authors asked respondents to agree or disagree with a number of statements about

the economy; what they found was a high level of agreement among professional economists on many of the statements. At the top of the list, with more than 90% of the economists agreeing, were the statements "Tariffs and import quotas usually reduce general economic welfare" and "A ceiling on rents reduces the quantity and quality of housing available." What's striking about these two statements is that many noneconomists disagree: tariffs and import quotas to

keep out foreign-produced goods are favored by many voters, and proposals to do away with rent control in cities like New York and San Francisco have met fierce political opposition.

So is the stereotype of quarreling economists a myth? Not entirely. Economists do disagree quite a lot on some issues, especially in macroeconomics, but they also find a great deal of common ground.

Suppose that the U.S. government was considering a value-added tax. Economist A may rely on a simplification of reality that focuses on the administrative costs of tax systems—that is, the costs of monitoring compliance, processing tax forms, collecting the tax, and so on. This economist might then point to the well-known high costs of administering a value-added tax and argue against the change. But economist B may think that the right way to approach the question is to ignore the administrative costs and focus on how the proposed law would change individual savings behavior. This economist might point to studies suggesting that value-added taxes promote higher consumer saving, a desirable result. Because the economists have made different simplifying assumptions, they arrive at different conclusions. And so the two economists may find themselves on different sides of the issue.

Most such disputes are eventually resolved by the accumulation of evidence that shows which of the various simplifying assumptions made by economists does a better job of fitting the facts. However, in economics, as in any science, it can take a long time before research settles important disputes—decades, in some cases. And since the economy is always changing in ways that make old approaches invalid or raise new policy questions, there are always new issues on which economists disagree. The policy maker must then decide which economist to believe.

MODULE 1 Review

Check Your Understanding

1. Provide an example of a resource from each of the four categories of resources.

2. What type of resource is each of the following?
   a. time spent flipping hamburgers at a restaurant
   b. a bulldozer
   c. a river

3. You make $45,000 per year at your current job with Whiz Kids Consultants. You are considering a job offer from Brainiacs, Inc., which would pay you $50,000 per year. Is each of the following elements an opportunity cost of accepting the new job at Brainiac, Inc.?

Answer yes or no, and explain your answer.
   a. the increased time spent commuting to your new job
   b. the $45,000 salary from your old job
   c. the more spacious office at your new job

4. Identify each of the following statements as positive or normative, and explain your answer.
   a. Society should take measures to prevent people from engaging in dangerous personal behavior.
   b. People who engage in dangerous personal behavior impose higher costs on society through higher medical costs.

Tackle the Test: Multiple-Choice Questions

1. Which of the following is an example of a resource?
   - I. petroleum
   - II. a factory
   - III. a cheeseburger dinner
   - a. I only
   - b. II only
   - c. III only
   - d. I and II only
   - e. I, II, and III

2. Which of the following is not an example of resource scarcity?
   - a. There is a finite amount of petroleum in the world.
   - b. Farming communities are experiencing droughts.
   - c. There are not enough physicians to satisfy all desires for health care in the United States.
   - d. Cassette tapes are no longer being produced.
   - e. Teachers would like to have more instructional technology in their classrooms.

3. Suppose that you prefer reading a book you already own to watching TV and that you prefer watching TV to listening to music. If these are your only three choices, what is the opportunity cost of reading?
   - a. watching TV and listening to music
   - b. watching TV

   - c. listening to music
   - d. sleeping
   - e. the price of the book

4. Which of the following statements is/are normative?
   - I. The price of gasoline is rising.
   - II. The price of gasoline is too high.
   - III. Gas prices are expected to fall in the near future.
   - a. I only
   - b. II only
   - c. III only
   - d. I and III only
   - e. I, II, and III

5. Which of the following questions is studied in microeconomics?
   - a. Should I go to college or get a job after I graduate?
   - b. What government policies should be adopted to promote employment in the economy?
   - c. How many people are employed in the economy this year?
   - d. Has the overall level of prices in the economy increased or decreased this year?
   - e. What determines the overall salary levels paid to workers in a given year?

Tackle the Test: Free-Response Questions

1. Define the term *resources*, and list the four categories of resources. What characteristic of resources results in the need to make choices?

Rubric for FRQ 1 (6 points)

1 point: Resources are anything that can be used to produce something else.

1 point each: The four categories of the economy's resources are land, labor, capital, and entrepreneurship.

1 point: The characteristic that results in the need to make choices is scarcity.

2. In what type of economic analysis do questions have a "right" or "wrong" answer? In what type of economic analysis do questions not necessarily have a "right" answer? On what type of economic analysis do economists tend to disagree most frequently? Why might economists disagree? Explain.
(5 points)

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MODULE 2

Introduction to Macroeconomics

In this Module, you will learn to:

- Explain what a business cycle is and why policy makers seek to diminish the severity of business cycles
- Describe how employment and unemployment are measured and how they change over the business cycle
- Define aggregate output and explain how it changes over the business cycle
- Define inflation and deflation and explain why price stability is preferred
- Explain how economic growth determines a country's standard of living
- Summarize the crucial role of models—simplified representations of reality—in economics

Today many people enjoy walking, biking, and horseback riding through New York's beautiful Central Park. But in 1932 there were many people living there in squalor. At that time, Central Park contained one of the many "Hoovervilles"—the shantytowns that had sprung up across America as a result of a catastrophic economic slump that had started in 1929. Millions of people were out of work and unable to feed, clothe, and house themselves and their families. Beginning in 1933, the U.S. economy would stage a partial recovery. But joblessness stayed high throughout the 1930s—a period that came to be known as the Great Depression.

Why the name "Hooverville"? These shantytowns were named after President Herbert Hoover, who had been elected president in 1928. When the Depression struck, people blamed the president: neither he nor his economic advisers seemed to understand what had happened or to know what to do to improve the situation. At that time, the field of macroeconomics was still in its infancy. It was only after the economy was plunged into catastrophe that economists began to closely examine how the macroeconomy works and to develop policies that might prevent such disasters in the future. To this day, the effort to understand economic slumps and find ways to prevent them is at the core of macroeconomics.

In this module, we will begin to explore the key features of macroeconomic analysis. We will look at some of the field's major concerns, including business cycles, employment, aggregate output, price stability, and economic growth.

The Business Cycle

The alternation between economic downturns and upturns in the macroeconomy is known as the **business cycle**. A **depression** is a very deep and prolonged downturn; fortunately, the United States hasn't had one since the Great Depression of the 1930s. Instead, we have experienced less prolonged economic downturns known as **recessions**, periods in which output and employment are falling. These are followed by economic upturns—periods in which output and employment are rising—known as **expansions** (sometimes called *recoveries*). According to the National Bureau of Economic Research there have been 11 recessions in the United States since World War II. During that period the average recession lasted 11 months, and the average expansion lasted 58 months. The average length of a business cycle, from the beginning of a recession to the beginning of the next recession, has been 5 years and 8 months. The shortest business cycle was 18 months, and the longest was 10 years and 8 months. The most recent economic downturn started in December 2007 and ended in June 2009. **Figure 2.1** shows the history of the U.S. unemployment rate since 1989 and the timing of business cycles. Recessions are indicated in the figure by the shaded areas.

The business cycle is an enduring feature of the economy. But even though ups and downs seem to be inevitable, most people believe that macroeconomic analysis has guided policies that help smooth out the business cycle and stabilize the economy.

What happens during a business cycle, and how can macroeconomic policies address the downturns? Let's look at three issues: employment and unemployment, aggregate output, and inflation and deflation.

The **business cycle** is the alternation between economic downturns, known as *recessions*, and economic upturns, known as *expansions*.

A **depression** is a very deep and prolonged downturn.

Recessions are periods of economic downturns when output and employment are falling.

Expansions, or recoveries, are periods of economic upturns when output and employment are rising.

AP® Exam Tip

Be prepared to identify the different phases of the business cycle so you can relate each phase to changes in employment, output, and growth.

Figure 2.1 The U.S. Unemployment Rate and the Timing of Business Cycles, 1989-2013

The unemployment rate, a measure of joblessness, rises sharply during recessions (indicated by shaded areas) and usually falls during expansions.

Source: Bureau of Labor Statistics.
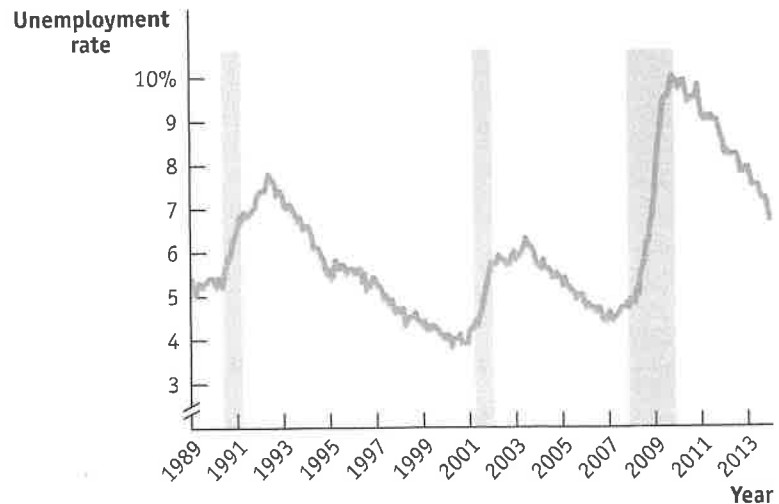
Employment, Unemployment, and the Business Cycle

Although not as severe as a depression, a recession is clearly an undesirable event. Like a depression, a recession leads to joblessness, reduced production, reduced incomes, and lower living standards.

To understand how job loss relates to the adverse effects of recessions, we need to understand something about how the labor force is structured. **Employment** is the total number of people who are currently working for pay, and **unemployment** is the total

Employment is the number of people who are currently working for pay in the economy.

Unemployment is the number of people who are actively looking for work but aren't currently employed.

Some readers may be wondering exactly how recessions and expansions are defined. The answer is that there is no exact definition!

In many countries, economists adopt the rule that a recession is a period of at least two consecutive quarters (a quarter is three months), during which aggregate output falls. The two-consecutive-quarter requirement is designed to avoid classifying brief hiccups in the economy's performance, with no lasting significance, as recessions.

Sometimes, however, this definition seems too strict. For example, an economy that has three months of sharply declining output, then three months of slightly positive growth, then another three months of rapid decline, should surely be considered to have endured a nine-month recession.

In the United States, we try to avoid such misclassifications by assigning the task of determining when a recession begins and ends to an independent panel of experts at the National Bureau of Economic Research (NBER). This panel looks at a variety of economic indicators, with the main focus on employment and production, but ultimately, the panel makes a judgment call.

Sometimes this judgment is controversial. In fact, there is lingering controversy over the 2001 recession. According to the NBER, that recession began in March 2001 and ended in November 2001, when output began rising. Some critics argue, however, that the recession really began several months earlier, when industrial production began falling. Other critics argue that the recession didn't really end in 2001 because employment continued to fall and the job market remained weak for another year and a half.

Finding a job was difficult in 2009.

number of people who are actively looking for work but aren't currently employed. A country's **labor force** is the sum of employment and unemployment.

The **unemployment rate**—the percentage of the labor force that is unemployed—is usually a good indicator of what conditions are like in the job market: a high unemployment rate signals a poor job market in which jobs are hard to find; a low unemployment rate indicates a good job market in which jobs are relatively easy to find. In general, during recessions the unemployment rate is rising, and during expansions it is falling. Look again at Figure 2.1, which shows the unemployment rate from 1989 through 2013. The graph shows significant changes in the unemployment rate. Note that even in the most prosperous times there is some unemployment. A booming economy, like that of the late 1990s, can push the unemployment rate down to 4% or even lower. But a severe recession, like the one that began in 2007, can push the unemployment rate into double digits.

The **labor force** is equal to the sum of employment and unemployment.

The **unemployment rate** is the percentage of the labor force that is unemployed.

Output is the quantity of goods and services produced.

Aggregate output is the economy's total production of goods and services for a given time period.

Aggregate Output and the Business Cycle

Rising unemployment is the most painful consequence of a recession, and falling unemployment the most urgently desired feature of an expansion. But the business cycle isn't just about jobs—it's also about **output**: the quantity of goods and services produced. During the business cycle, the economy's level of output and its unemployment rate move in opposite directions. At lower levels of output, fewer workers are needed, and the unemployment rate is relatively high. Growth in output requires the efforts of more workers, which lowers the unemployment rate. To measure the rise and fall of an economy's output, we look at **aggregate output**—the economy's total production of goods and services for a given time period, usually a year. Aggregate output normally falls during recessions and rises during expansions.

Inflation, Deflation, and Price Stability

In 1970 the average production worker in the United States was paid $3.40 an hour. By October 2013 the average hourly earnings for such a worker had risen to $19.65. Three cheers for economic progress!

But wait—American workers were paid much more in 2013, but they also faced a much higher cost of living. In 1970 a dozen eggs cost only about $0.58; by October 2013 that was up to $1.93. The price of a loaf of white bread went from about $0.20 to $1.36. And the price of a gallon of gasoline rose from just $0.33 to $3.43. If we compare the percentage increase in hourly earnings between 1970 and October 2013 with the increases in the prices of some standard items, we see that the average worker's paycheck goes just about as far today as it did in 1970. In other words, the increase in the cost of living wiped out many, if not all, of the wage gains of the typical worker from 1970 to 2013. What caused this situation?

Between 1970 and 2013, the economy experienced substantial **inflation**, a rise in the overall price level. The opposite of inflation is **deflation**, a fall in the overall price level. A change in the prices of a few goods changes the opportunity cost of purchasing those goods but does not constitute inflation or deflation. These terms are reserved for more general changes in the prices of goods and services throughout the economy.

Both inflation and deflation can pose problems for the economy. Inflation discourages people from holding on to cash, because if the price level is rising, cash loses value. That is, if the price level rises, a dollar will buy less than it would before. As we will see later in our more detailed discussion of inflation, in periods of rapidly rising prices, people stop holding cash altogether and instead trade goods for goods.

Deflation can cause the opposite problem. That is, if the overall price level falls, a dollar will buy more than it would before. In this situation it can be more attractive for people with cash to hold on to it rather than to invest in new factories and other productive assets. This can deepen a recession.

In later modules we will look at other costs of inflation and deflation. For now, note that economists have a general goal of **price stability**—meaning that the overall price level is changing only slowly if at all—because it avoids uncertainty about prices and helps to keep the economy stable.

A rising overall price level is **inflation**.

A falling overall price level is **deflation**.

The economy has **price stability** when the overall price level is changing only slowly if at all.

Economic Growth

In 1955 Americans were delighted with the nation's prosperity. The economy was expanding, consumer goods that had been rationed during World War II were available for everyone to buy, and most Americans believed, rightly, that they were better off than citizens of any other nation, past or present. Yet by today's standards Americans were quite poor in 1955. For example, in 1955 only 33% of American homes contained washing machines, and hardly anyone had air conditioning. If we turn the clock back to 1905, we find that life for most Americans was startlingly primitive by today's standards.

Why are the vast majority of Americans today able to afford conveniences that many lacked in 1955? The answer is **economic growth**, an increase in the maximum possible output of an economy. Unlike the short-term increases in aggregate output that occur as an economy recovers from a downturn in the business cycle, economic growth is an increase in productive capacity that permits a sustained rise in aggregate output over time. **Figure 2.2** on the next page shows annual figures for U.S. real gross domestic product (GDP) per capita—the value of final goods and services produced in the U.S. per person—from 1900 to 2013. As a result of this economic growth, the U.S. economy's aggregate output per person was more than eight times as large in 2013 as it was in 1900.

Economic growth is fundamental to a nation's prosperity. A sustained rise in output per person allows for higher wages and a rising standard of living. The need for economic growth is urgent in poorer, less developed countries, where a lack of basic necessities makes growth a central concern of economic policy.

As you will see when studying macroeconomics, the goal of economic growth can be in conflict with the goal of hastening recovery from an economic downturn. What is good for economic growth can be bad for short-run stabilization of the business cycle, and vice versa.

We have seen that macroeconomics is concerned with the long-run trends in aggregate output as well as the short-run ups and downs of the business cycle. Now that

I could hug Ada
-she thinks of everything

Ajax Domestic Appliance Co. Ltd., Halifax, Yorks
Proprietors : Ada (Halifax) Ltd.

Economic growth is an increase in the maximum amount of goods and services an economy can produce.

Figure 2.2 Growth, the Long View

Over the long run, growth in real GDP per capita has dwarfed the ups and downs of the business cycle. Except for the recession that began the Great Depression, recessions are almost invisible.

Sources: Angus Maddison, "Statistics on World Population, GDP and Per Capita GDP, 1–2006 AD," http://www.ggdc.net/maddison; Jutta Bolt and Jan Luiten van Zanden, "The First Update of the Maddison Project; Re-estimating Growth Before 1820;" Bureau of Economic Analysis.
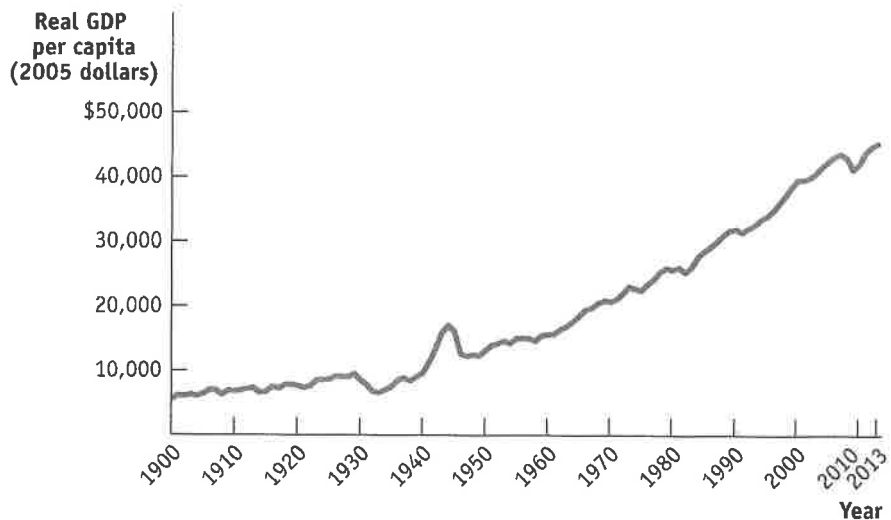
Economic growth is an increase in the economy's potential output. Changes in real GDP (output) do not necessarily indicate economic growth. Temporary fluctuations in economic conditions often alter real GDP when there has been no change in the economy's potential output.

A **model** is a simplified representation used to better understand a real-life situation.

The **other things equal assumption** means that all other relevant factors remain unchanged. This is also known as the *ceteris paribus* assumption.

we have a general understanding of the important topics studied in macroeconomics, we are almost ready to apply economic principles to real economic issues. To do this requires one more step—an understanding of how economists use *models*.

The Use of Models in Economics

In 1901, one year after their first glider flights at Kitty Hawk, the Wright brothers built something else that would change the world—a wind tunnel. This was an apparatus that let them experiment with many different designs for wings and control surfaces. These experiments gave them knowledge that would make heavier-than-air flight possible. Needless to say, testing an airplane design in a wind tunnel is cheaper and safer than building a full-scale version and hoping it will fly. More generally, models play a crucial role in almost all scientific research—economics included.

A **model** is any simplified version of reality that is used to better understand a real-life situation. But how do we create a simplified representation of an economic situation? One possibility—an economist's equivalent of a wind tunnel—is to find or create a real but simplified economy. For example, economists interested in the economic role of money have studied the system of exchange that developed in World War II prison camps, in which cigarettes became a universally accepted form of payment, even among prisoners who didn't smoke.

Another possibility is to simulate the workings of the economy on a computer. For example, when changes in tax law are proposed, government officials use *tax models*—large mathematical computer programs—to assess how the proposed changes would affect different groups of people. Models can also be depicted by graphs and equations. Starting in the next module you will see how graphical models illustrate the relationships between variables and reveal the effects of changes in the economy.

Models are important because their simplicity allows economists to focus on the influence of only one change at a time. That is, they allow us to hold everything else constant and to study how one change affects the overall economic outcome. So when building economic models, an important assumption is the **other things equal assumption**, which means that all other relevant factors remain unchanged. Sometimes the Latin phrase *ceteris paribus*, which means "other things equal," is used.

But it isn't always possible to find or create a small-scale version of the whole economy, and a computer program is only as good as the data it uses. (Programmers have a

saying: garbage in, garbage out.) For many purposes, the most effective form of economic modeling is the construction of "thought experiments": simplified, hypothetical versions of real-life situations. And as you will see throughout this book, economists' models are very often in the form of a graph. In the next module, we will look at the *production possibilities curve*, a model that helps economists think about the choices every economy faces.

MODULE 2 Review

Check Your Understanding

1. Describe two types of models used by economists.

2. Describe who gets hurt in a recession and how they are hurt.

Tackle the Test: Multiple-Choice Questions

1. During the recession phase of a business cycle, which of the following is likely to increase?
   a. the unemployment rate
   b. the price level
   c. economic growth rates
   d. the labor force
   e. wages

2. The labor force is made up of everyone who is
   a. employed.
   b. old enough to work.
   c. actively seeking work.
   d. employed or unemployed.
   e. employed or capable of working.

3. Which of the following provides a long-term increase in the productive capacity of an economy?
   a. an expansion
   b. a recovery
   c. a recession
   d. a depression
   e. economic growth

4. Which of the following is the most likely result of inflation?
   a. falling employment
   b. a dollar will buy more than it did before
   c. people are discouraged from holding cash
   d. price stability
   e. low aggregate output per capita

5. The other things equal assumption allows economists to
   a. avoid making assumptions about reality.
   b. focus on the effects of only one change at a time.
   c. oversimplify.
   d. allow nothing to change in their model.
   e. reflect all aspects of the real world in their model.

Tackle the Test: Free-Response Questions

1. Define an expansion and economic growth, and explain the difference between the two concepts.

Rubric for FRQ 1 (3 points)

1 point: An expansion is the period of recovery after an economic downturn.

1 point: Economic growth is an increase in the productive capacity of the economy.

1 point: An expansion can occur regardless of any increase in the economy's long-term potential for production, and it only lasts until the next downturn, while economic growth increases the economy's ability to produce more goods and services over the long term.

2. Define inflation, and explain why an increase in the price of donuts does not indicate that inflation has occurred. **(2 points)**

MODULE 3

The Production Possibilities Curve Model

In this Module, you will learn to:

- Explain the importance of trade-offs in economic analysis
- Describe what the production possibilities curve model tells us about efficiency, opportunity cost, and economic growth
- Explain why increases in the availability of resources and improvements in technology are the two sources of economic growth

A good economic model can be a tremendous aid to understanding. In this module, we look at the *production possibilities curve*, a model that helps economists think about the *trade-offs* every economy faces. The production possibilities curve helps us understand three important aspects of the real economy: efficiency, opportunity cost, and economic growth.

Trade-offs: The Production Possibilities Curve

The 2000 hit movie *Cast Away*, starring Tom Hanks, was an update of the classic story of Robinson Crusoe, the hero of Daniel Defoe's eighteenth-century novel. Hanks played the role of a sole survivor of a plane crash who was stranded on a remote island. As in the original story of Robinson Crusoe, the Hanks character had limited resources: the natural resources of the island, a few items he managed to salvage from the plane, and, of course, his own time and effort. With only these resources, he had to make a life. In effect, he became a one-man economy.

One of the important principles of economics we introduced in Module 1 was that resources are scarce. As a result, any economy—whether it contains one person or millions of people—faces trade-offs. You make a **trade-off** when you give up something in order to have something else. For example, if a castaway devotes more resources to catching fish, he benefits by catching more fish, but he cannot use those same resources to gather coconuts, so the trade-off is that he has fewer coconuts.

You make a **trade-off** when you give up something in order to have something else.

To think about the trade-offs necessary in any economy, economists often use the **production possibilities curve** model. The idea behind this model is to improve our understanding of trade-offs by considering a simplified economy that produces only two goods. This simplification enables us to show the trade-offs graphically.

Figure 3.1 shows a hypothetical production possibilities curve for Tom, a castaway alone on an island, who must make a trade-off between fish production and coconut production. The curve shows the maximum quantity of fish Tom can catch during a week *given* the quantity of coconuts he gathers, and vice versa. That is, it answers questions of the form, "What is the maximum quantity of fish Tom can catch if he also gathers 9 (or 15, or 30) coconuts?"

The **production possibilities curve** illustrates the trade-offs facing an economy that produces only two goods. It shows the maximum quantity of one good that can be produced for each possible quantity of the other good produced.

Figure 3.1 The Production Possibilities Curve

The production possibilities curve illustrates the trade-offs facing an economy that produces two goods. It shows the maximum quantity of one good that can be produced, given the quantity of the other good produced. Here, the maximum quantity of coconuts that Tom can gather depends on the quantity of fish he catches, and vice versa. His feasible production is shown by the area *inside* or *on* the curve. Production at point C is feasible but not efficient. Points A and B are feasible and *productively efficient*, but point D is not feasible.
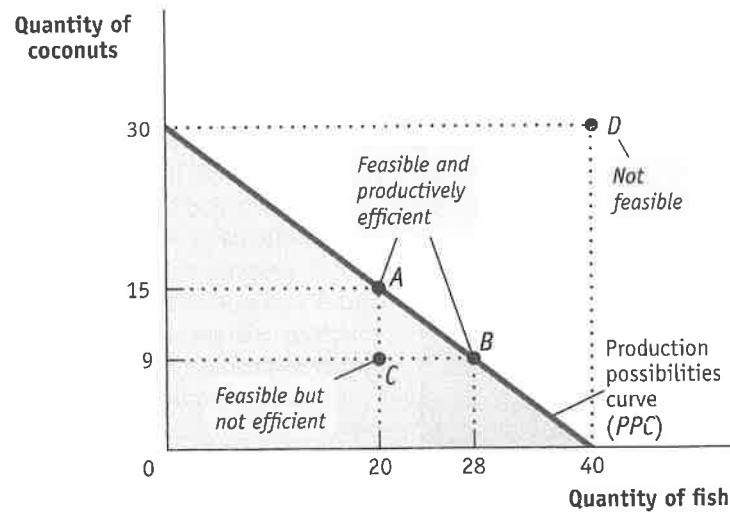
There is a crucial distinction between points *inside* or *on* the production possibilities curve (the shaded area) and points *outside* the production possibilities curve. If a production point lies inside or on the curve—like point C, at which Tom catches 20 fish and gathers 9 coconuts—it is feasible. After all, the curve tells us that if Tom catches 20 fish, he could also gather a maximum of 15 coconuts, so he could certainly gather 9 coconuts. However, a production point that lies outside the curve—such as point D, which would have Tom catching 40 fish and gathering 30 coconuts—isn't feasible.

In Figure 3.1, the production possibilities curve intersects the horizontal axis at 40 fish. This means that if Tom devoted all his resources to catching fish, he would catch 40 fish per week but would have no resources left over to gather coconuts. The production possibilities curve intersects the vertical axis at 30 coconuts. This means that if Tom devoted all his resources to gathering coconuts, he could gather 30 coconuts per week but would have no resources left over to catch fish. Thus, if Tom wants 30 coconuts, the trade-off is that he can't have any fish.

The curve also shows less extreme trade-offs. For example, if Tom decides to catch 20 fish, he would be able to gather at most 15 coconuts; this production choice is illustrated by point A. If Tom decides to catch 28 fish, he could gather at most 9 coconuts, as shown by point B.

Thinking in terms of a production possibilities curve simplifies the complexities of reality. The real-world economy produces millions of different goods. Even a castaway on an island would produce more than two different items (for example, he would need clothing and housing as well as food). But in this model we imagine an economy that produces only two goods, because in a model with many goods, it would be much harder to study trade-offs, efficiency, and economic growth.

AP® Exam Tip

Be prepared to draw a correctly labeled production possibilities curve and use it to identify opportunity cost, efficient points, inefficient points, and unattainable points. Unemployment results in production at a point below the production possibilities curve. Most production possibilities curves are concave to the origin, as shown in Figure 3.2 on page 19, due to the specialization of resources.

Efficiency

The production possibilities curve is useful for illustrating the general economic concept of efficiency. An economy is **efficient** if there are no missed opportunities—meaning that there is no way to make some people better off without making other people worse off. For example, suppose a course you are taking meets in a classroom that is too small for the number of students—some may be forced to sit on the floor or stand—despite the fact that a larger classroom nearby is empty during the same period. Economists would say that this is an *inefficient* use of resources because there is a way to make some people better off without making anyone worse off—after all, the larger classroom is empty. The school is not using its resources efficiently. When an economy is using all of its resources efficiently, the only way one person can be made better off is by rearranging the use of resources in such a way that the change makes someone else worse off. So in our classroom example, if all larger classrooms were already fully occupied, we could say that the school was run in an efficient way; your classmates could be made better off only by making people in the larger classroom worse off—by moving them to the room that is too small.

Returning to our castaway example, as long as Tom produces a combination of coconuts and fish that is on the production possibilities curve, his production is efficient. At point *A*, the 15 coconuts he gathers are the maximum quantity he can get *given* that he has chosen to catch 20 fish; at point *B*, the 9 coconuts he gathers are the maximum he can get *given* his choice to catch 28 fish; and so on. If an economy is producing at a point on its production possibilities curve, we say that the economy has achieved **productive efficiency**.

But suppose that for some reason Tom was at point *C*, producing 20 fish and 9 coconuts. Then this one-person economy would definitely not be productively efficient and would therefore be inefficient: it is missing the opportunity to produce more of both goods.

Another example of inefficiency in production occurs when people in an economy are involuntarily unemployed: they want to work but are unable to find jobs. When that happens, the economy is not productively efficient because it could produce more output if those people were employed. The production possibilities curve shows the amount that can *possibly* be produced if all resources are fully employed. In other words, changes in unemployment move the economy closer to, or further away from, the production possibilities curve (*PPC*). But the curve itself is determined by what would be possible if there were no unemployment in the economy. Greater unemployment is represented by points farther below the *PPC*—the economy is not reaching its possibilities if it is not using all of its resources. Lower unemployment is represented by points closer to the *PPC*—as unemployment decreases, the economy moves closer to reaching its possibilities.

Although the production possibilities curve helps clarify what it means for an economy to achieve productive efficiency, it's important to understand that productive efficiency is only *part* of what's required for the economy as a whole to be efficient. Efficiency also requires that the economy allocate its resources so that consumers are as well off as possible. If an economy does this, we say that it has achieved **allocative efficiency**. To see why allocative efficiency is as important as productive efficiency, notice that points *A* and *B* in Figure 3.1 both represent situations in which the economy is productively efficient, because in each case it can't produce more of one good without producing less of the other. But these two situations may not be equally desirable. Suppose that Tom prefers point *B* to point *A*—that is, he would rather consume 28 fish and 9 coconuts than 20 fish and 15 coconuts. Then point *A* is inefficient from the point of view of the economy as a whole: it's possible to make Tom better off without making anyone else worse off. (Of course, in this castaway economy there isn't anyone else; Tom is all alone.)

This example shows that efficiency for the economy as a whole requires *both* productive and allocative efficiency. To be efficient, an economy must produce as much of each good as it can, given the production of other goods, and it must also produce the mix of goods that people want to consume.
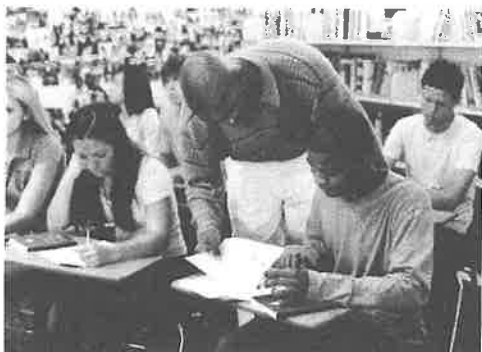
A crowded classroom reflects inefficiency if switching to a larger classroom would make some students better off without making anyone worse off.
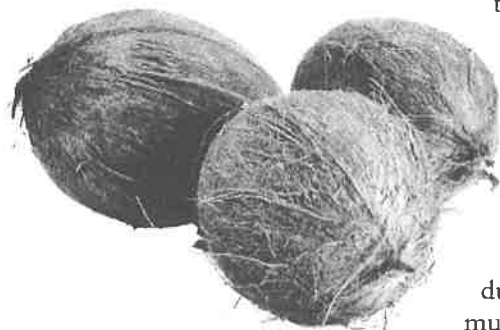
Opportunity Cost

The production possibilities curve is also useful as a reminder that the true cost of any good is not only its price, but also everything else in addition to money that must be given up in order to get that good—the *opportunity cost*. If, for example, Tom decides to go from point A to point B, he will produce 8 more fish but 6 fewer coconuts. So the opportunity cost of those 8 fish is the 6 coconuts not gathered. Since 8 extra fish have an opportunity cost of 6 coconuts, 1 fish has an opportunity cost of $^6/_8 = \frac{3}{4}$ of a coconut.

Is the opportunity cost of an extra fish in terms of coconuts always the same, no matter how many fish Tom catches? In the example illustrated by Figure 3.1, the answer is yes. If Tom increases his catch from 28 to 40 fish, an increase of 12, the number of coconuts he gathers falls from 9 to zero. So his opportunity cost per additional fish is $^9/_{12} = \frac{3}{4}$ of a coconut, the same as it was when his catch went from 20 fish to 28. However, the fact that in this example the opportunity cost of an additional fish in terms of coconuts is always the same is a result of an assumption we've made, an assumption that's reflected in the way Figure 3.1 is drawn. Specifically, whenever we assume that the opportunity cost of an additional unit of a good doesn't change regardless of the output mix, the production possibilities curve is a straight line.

Moreover, as you might have already guessed, the slope of a straight-line production possibilities curve is equal to the opportunity cost—specifically, the opportunity cost for the good measured on the horizontal axis in terms of the good measured on the vertical axis. In Figure 3.1, the production possibilities curve has a *constant slope* of $-\frac{3}{4}$, implying that Tom faces a *constant opportunity cost* per fish equal to $\frac{3}{4}$ of a coconut. (A review of how to calculate the slope of a straight line is found in the Section 1 Appendix.) This is the simplest case, but the production possibilities curve model can also be used to examine situations in which opportunity costs change as the mix of output changes.

Figure 3.2 illustrates a different assumption, a case in which Tom faces *increasing opportunity cost*. Here, the more fish he catches, the more coconuts he has to give up to catch an additional fish, and vice versa. For example, to go from producing zero fish to producing 20 fish, he has to give up 5 coconuts. That is, the opportunity cost of those 20 fish is 5 coconuts. But to increase his fish production from 20 to 40—that is, to produce an additional 20 fish—he must give up 25 more coconuts, a much higher opportunity cost. As you can see in Figure 3.2, when opportunity costs are increasing

Figure 3.2 Increasing Opportunity Cost

The bowed-out shape of the production possibilities curve reflects increasing opportunity cost. In this example, to produce the first 20 fish, Tom must give up 5 coconuts. But to produce an additional 20 fish, he must give up 25 more coconuts.
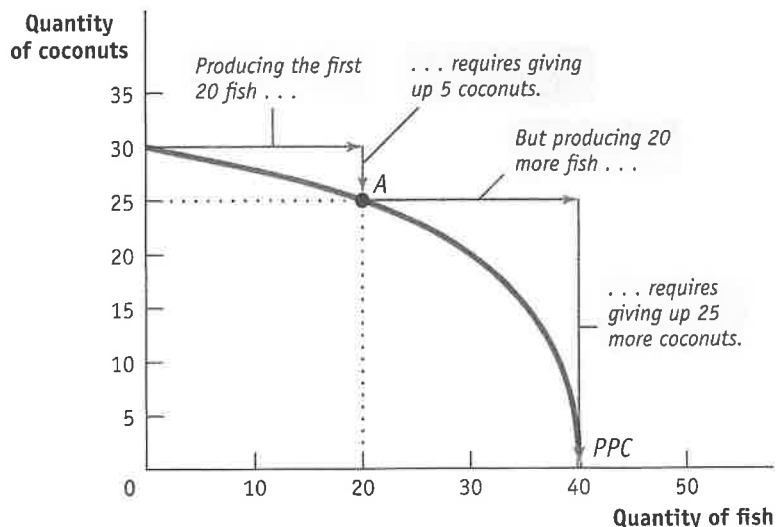
rather than constant, the production possibilities curve is a bowed-out curve rather than a straight line.

Although it's often useful to work with the simple assumption that the production possibilities curve is a straight line, economists believe that in reality, opportunity costs are typically increasing. When only a small amount of a good is produced, the opportunity cost of producing that good is relatively low because the economy needs to use only those resources that are especially well suited for its production. For example, if an economy grows only a small amount of corn, that corn can be grown in places where the soil and climate are perfect for growing corn but less suitable for growing anything else, such as wheat. So growing that corn involves giving up only a small amount of potential wheat output. Once the economy grows a lot of corn, however, land that is well suited for wheat but isn't so great for corn must be used to produce corn anyway. As a result, the additional corn production involves sacrificing considerably more wheat production. In other words, as more of a good is produced, its opportunity cost typically rises because well-suited inputs are used up and less adaptable inputs must be used instead.

Economic Growth

Finally, the production possibilities curve helps us understand what it means to talk about *economic growth*. We introduced the concept of economic growth in Module 2, saying that it allows *a sustained rise in aggregate output*. We learned that economic growth is one of the fundamental features of the economy. But are we really justified in saying that the economy has grown over time? After all, although the U.S. economy produces more of many things than it did a century ago, it produces less of other things—for example, horse-drawn carriages. In other words, production of many goods is actually down. So how can we say for sure that the economy as a whole has grown?

The answer, illustrated in **Figure 3.3**, is that economic growth means an *expansion of the economy's production possibilities*: the economy *can* produce more of everything. For example, if Tom's production is initially at point A (20 fish and 25 coconuts), economic growth means that he could move to point E (25 fish and 30 coconuts). Point E lies outside the original curve, so in the production possibilities curve model, growth is shown as an outward shift of the curve. Unless the PPC shifts outward, the points beyond the PPC are unattainable. Those points beyond a given PPC are beyond the economy's possibilities.

Figure 3.3 Economic Growth

Economic growth results in an *outward shift* of the production possibilities curve because production possibilities are expanded. The economy can now produce more of everything. For example, if production is initially at point A (20 fish and 25 coconuts), it could move to point E (25 fish and 30 coconuts).
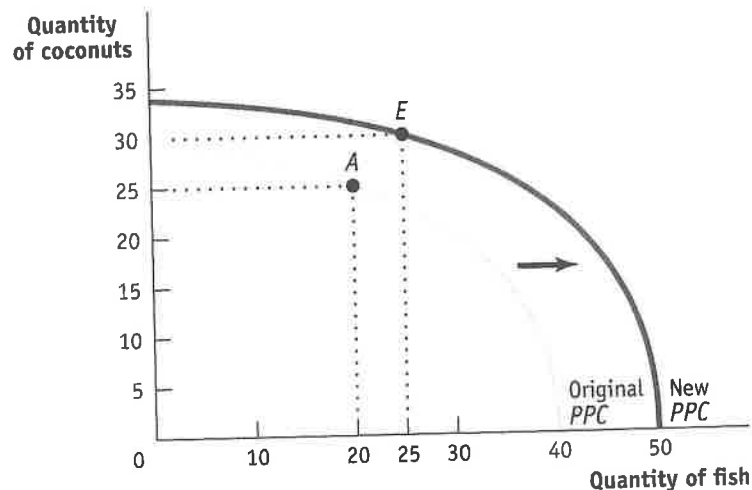
What can cause the production possibilities curve to shift outward? There are two general sources of economic growth. One is an increase in the resources used to produce goods and services: labor, land, capital, and entrepreneurship. To see how adding to an economy's resources leads to economic growth, suppose that Tom finds a fishing net washed ashore on the beach. The fishing net is a resource he can use to produce more fish in the course of a day spent fishing. We can't say how many more fish Tom will catch; that depends on how much time he decides to spend fishing now that he has the net. But because the net makes his fishing more productive, he can catch more fish without reducing the number of coconuts he gathers, or he can gather more coconuts without reducing his fish catch. So his production possibilities curve shifts outward.

The other source of economic growth is progress in **technology**, the technical means for the production of goods and services. Suppose Tom figures out a better way either to catch fish or to gather coconuts—say, by inventing a fishing hook or a wagon for transporting coconuts. Either invention would shift his production possibilities curve outward. However, the shift would not be a simple outward expansion of every point along the *PPC*. Technology specific to the production of only one good has no effect if all resources are devoted to the other good: a fishing hook will be of no use if Tom produces nothing but coconuts. So the point on the *PPC* that represents the number of coconuts that can be produced if there is no fishing will not change. In real-world economies, innovations in the techniques we use to produce goods and services have been a crucial force behind economic growth.

Again, economic growth means an increase in what the economy *can* produce. What the economy actually produces depends on the choices people make. After his production possibilities expand, Tom might not choose to produce both more fish and more coconuts; he might choose to increase production of only one good, or he might even choose to produce less of one good. For example, if he gets better at catching fish, he might decide to go on an all-fish diet and skip the coconuts, just as the introduction of motor vehicles led most people to give up horse-drawn carriages. But even if, for some reason, he chooses to produce either fewer coconuts or fewer fish than before, we would still say that his economy has grown, because he *could* have produced more of everything. If an economy's production possibilities curve shifts inward, the economy has become smaller. This could happen if the economy loses resources or technology (for example, if it experiences war or a natural disaster).

The production possibilities curve is a very simplified model of an economy, yet it teaches us important lessons about real-life economies. It gives us our first clear sense of what constitutes economic efficiency, it illustrates the concept of opportunity cost, and it makes clear what economic growth is all about.
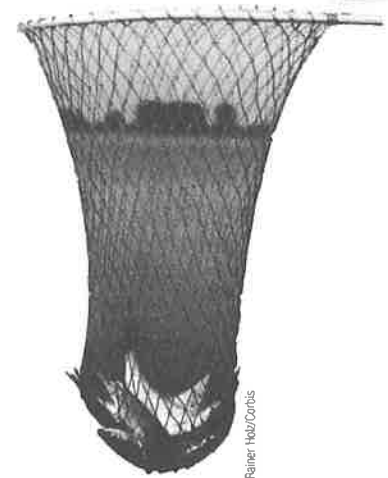
Technology is the technical means for producing goods and services.

MODULE 4

Comparative Advantage and Trade

In this Module, you will learn to:

- Explain how trade leads to gains for an individual or an economy

- Explain the difference between absolute advantage and comparative advantage

- Describe how comparative advantage leads to gains from trade in the global marketplace

Gains from Trade

In a market economy, individuals engage in **trade**: they provide goods and services to others and receive goods and services in return.

There are **gains from trade**: people can get more of what they want through trade than they could if they tried to be self-sufficient. This increase in output is due to **specialization**: each person specializes in the task that he or she is good at performing.

A family could try to take care of all its own needs—growing its own food, sewing its own clothing, providing itself with entertainment, and writing its own economics textbooks. But trying to live that way would be very hard. The key to a much better standard of living for everyone is **trade**, in which people divide tasks among themselves and each person provides a good or service that other people want in return for different goods and services that he or she wants.

The reason we have an economy, rather than many self-sufficient individuals, is that there are **gains from trade**: by dividing tasks and trading, two people (or 7 billion people) can each get more of what they want than they could get by being self-sufficient. Gains from trade arise, in particular, from this division of tasks, which economists call **specialization**—a situation in which different people each engage in a different task.

The advantages of specialization, and the resulting gains from trade, were the starting point for Adam Smith's 1776 book *The Wealth of Nations*, which many regard as the beginning of economics as a discipline. Smith's book begins with a description of an eighteenth-century pin factory where, rather than each of the 10 workers making a pin from start to finish, each worker specialized in one of the many steps in pin-making:

> One man draws out the wire, another straights it, a third cuts it, a fourth points it, a fifth grinds it at the top for receiving the head; to make the head requires two or three distinct operations; to put it on, is a particular business, to whiten the pins is another; it is even a trade by itself to put them into the paper; and the important business of making a pin is, in this manner, divided into about eighteen distinct operations. . . . Those ten persons, therefore, could make among them upwards of forty-eight thousand pins in a day. But if they had all wrought separately and independently, and without any of them having been educated to this particular business, they certainly could not each of them have made twenty, perhaps not one pin a day. . . .

The same principle applies when we look at how people divide tasks among themselves and trade in an economy. The economy, as a whole, can produce more when each person *specializes* in a task and *trades* with others.

The benefits of specialization are the reason a person typically focuses on the production of only one type of good or service. It takes many years of study and experience to become a doctor; it also takes many years of study and experience to become a commercial airline pilot. Many doctors might have the potential to become excellent pilots, and vice versa, but it is very unlikely that anyone who decided to pursue both careers would be as good a pilot or as good a doctor as someone who specialized in only one of those professions. So it is to everyone's advantage when individuals specialize in their career choices.

Markets are what allow a doctor and a pilot to specialize in their respective fields. Because markets for commercial flights and for doctors' services exist, a doctor is assured that she can find a flight and a pilot is assured that he can find a doctor. As long as individuals know that they can find the goods and services that they want in the market, they are willing to forgo self-sufficiency and are willing to specialize.

Comparative Advantage and Gains from Trade

The production possibilities curve model is particularly useful for illustrating gains from trade—trade based on *comparative advantage*. Let's stick with Tom being stranded on his island, but now let's suppose that a second castaway, who just happens to be named Hank, is washed ashore. Can Tom and Hank benefit from trading with each other?
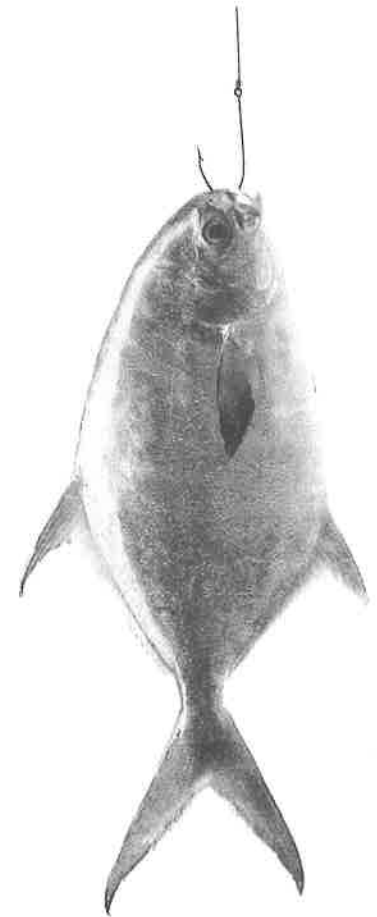
It's obvious that there will be potential gains from trade if the two castaways do different things particularly well. For example, if Tom is a skilled fisherman and Hank is very good at climbing trees, clearly it makes sense for Tom to catch fish and Hank to gather coconuts—and for the two men to trade the products of their efforts.

But one of the most important insights in all of economics is that there are gains from trade even if one of the trading parties isn't especially good at anything. Suppose, for example, that Hank is less well suited to primitive life than Tom; he's not nearly as good at catching fish, and compared to Tom, even his coconut-gathering leaves something to be desired. Nonetheless, what we'll see is that both Tom and Hank can live better by trading with each other than either could alone.

For the purposes of this example, let's go back to the simple case of straight-line production possibilities curves. Tom's production possibilities are represented by the production possibilities curve in panel (a) of **Figure 4.1** on the next page, which is the same as the production possibilities curve in Figure 3.1 (page 17). According to this PPC, Tom could catch 40 fish, but only if he gathered no coconuts, and he could gather 30 coconuts, but only if he caught no fish. Recall that this means that the slope of his production possibilities curve is −¾: his opportunity cost of 1 fish is ¾ of a coconut.
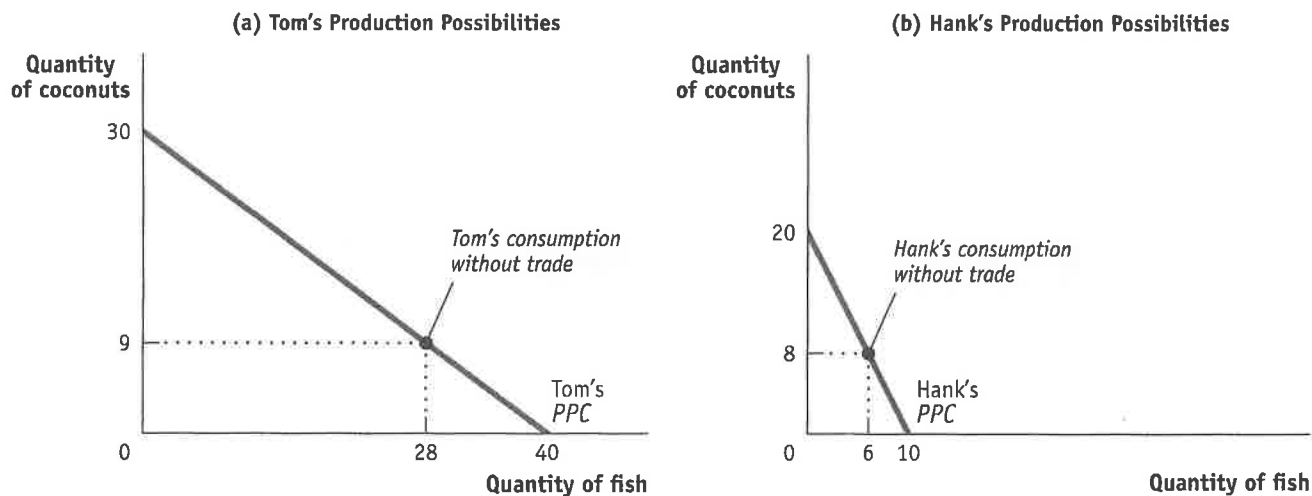
Panel (b) of Figure 4.1 shows Hank's production possibilities. Like Tom's, Hank's production possibilities curve is a straight line, implying a constant opportunity cost of fish in terms of coconuts. His production possibilities curve has a constant slope of −2. Hank is less productive all around: at most he can produce 10 fish or 20 coconuts. But he is particularly bad at fishing: whereas Tom sacrifices ¾ of a coconut per fish caught, for Hank the opportunity cost of a fish is 2 whole coconuts. **Table 4.1** on the next page summarizes the two castaways' opportunity costs of fish and coconuts.

Now, Tom and Hank could go their separate ways, each living on his own side of the island, catching his own fish and gathering his own coconuts. Let's suppose that they start out that way and make the consumption choices shown in Figure 4.1: in the absence of trade, Tom consumes 28 fish and 9 coconuts per week, while Hank consumes 6 fish and 8 coconuts.

Figure 4.1 Production Possibilities for Two Castaways

(a) Tom's Production Possibilities

Quantity of coconuts (y-axis): 30, 9

Tom's consumption without trade

Tom's PPC

Quantity of fish (x-axis): 0, 28, 40

(b) Hank's Production Possibilities

Quantity of coconuts (y-axis): 20, 8

Hank's consumption without trade

Hank's PPC

Quantity of fish (x-axis): 0, 6, 10

Here, each of the two castaways has a constant opportunity cost of fish and a straight-line production possibilities curve. In Tom's case, each fish has an opportunity cost of ¾ of a coconut. In Hank's case, each fish has an opportunity cost of 2 coconuts.

Table 4.1 Tom's and Hank's Opportunity Costs of Fish and Coconuts

	Tom's Opportunity Cost	Hank's Opportunity Cost
One fish	3/4 coconut	2 coconuts
One coconut	4/3 fish	1/2 fish

But is this the best they can do? No, it isn't. Given that the two castaways have different opportunity costs, they can strike a deal that makes both of them better off. **Table 4.2** shows how such a deal works: Tom specializes in the production of fish, catching 40 per week, and gives 10 to Hank. Meanwhile, Hank specializes in the production of coconuts, gathering 20 per week, and gives 10 to Tom. The result is shown in **Figure 4.2**. Tom now consumes more of both goods than before: instead of 28 fish and 9 coconuts, he consumes 30 fish and 10 coconuts. Hank also consumes more, going from 6 fish and 8 coconuts to 10 fish and 10 coconuts. As Table 4.2 also shows, both Tom and Hank experience gains from trade: Tom's consumption of fish increases by two, and his consumption of coconuts increases by one. Hank's consumption of fish increases by four, and his consumption of coconuts increases by two.

So both castaways are better off when they each specialize in what they are good at and trade with each other. It's a good idea for Tom to catch the fish for both of them, because his opportunity cost of a fish is only ¾ of a coconut not gathered versus 2 coconuts for Hank. Correspondingly, it's a good idea for Hank to gather coconuts for both of them.

Or we could describe the situation in a different way. Because Tom is so good at catching fish, his opportunity cost of gathering coconuts is high: ⁴⁄₃ of a fish not caught for every coconut gathered. Because Hank is a pretty poor fisherman, his opportunity cost of gathering coconuts is much less, only ½ of a fish per coconut.

Table 4.2 How the Castaways Gain from Trade

		Without Trade		With Trade		Gains from Trade
		Production	Consumption	Production	Consumption	
Tom	Fish	28	28	40	30	+2
	Coconuts	9	9	0	10	+1
Hank	Fish	6	6	0	10	+4
	Coconuts	8	8	20	10	+2

An individual has a **comparative advantage** in producing something if the opportunity cost of that production is lower for that individual than for other people. In other words, Hank has a comparative advantage over Tom in producing a particular good or service if Hank's opportunity cost of producing that good or service is lower than Tom's. In this case, Hank has a comparative advantage in gathering coconuts and Tom has a comparative advantage in catching fish.

Notice that Tom is actually better than Hank at producing both goods: Tom can catch more fish in a week, and he can also gather more coconuts. This means that Tom has an **absolute advantage** in both activities: he can produce more output with a given amount of input (in this case, his time) than Hank can. It might seem as though Tom has nothing to gain from trading with less competent Hank. But we've just seen that Tom can indeed benefit from a deal with Hank, because *comparative*, not *absolute*, advantage is the basis for mutual gain. It doesn't matter that it takes Hank more time to gather a coconut; what matters is that for him the opportunity cost of that coconut in terms of fish is lower. So, despite his absolute disadvantage in both activities, Hank has a comparative advantage in coconut gathering. Meanwhile Tom, who can use his time better by catching fish, has a comparative disadvantage in coconut gathering.

An individual has a **comparative advantage** in producing a good or service if the opportunity cost of producing the good or service is lower for that individual than for other people.

An individual has an **absolute advantage** in producing a good or service if he or she can make more of it with a given amount of time and resources. Having an absolute advantage is not the same thing as having a comparative advantage.

Figure 4.2 Comparative Advantage and Gains from Trade

(a) Tom's Production and Consumption

(b) Hank's Production and Consumption
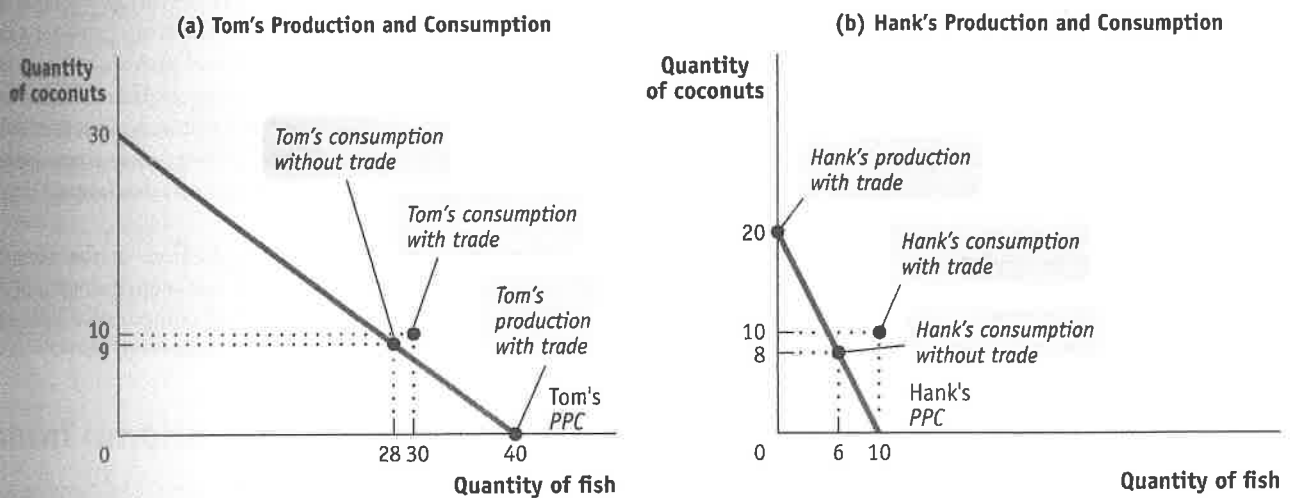
By specializing and trading, the two castaways can produce and consume more of both goods. Tom specializes in catching fish, his comparative advantage, and Hank—who has an *absolute* disadvantage in both goods but a *comparative* advantage in coconuts—specializes in gathering coconuts. The result is that each castaway can consume more of both goods than either could without trade.

Mutually Beneficial Terms of Trade

The **terms of trade** indicate the rate at which one good can be exchanged for another. In our story, Tom and Hank traded 10 coconuts for 10 fish, so each coconut traded for 1 fish. Why not some other terms of trade, such as ¾ fish per coconut? Indeed, there are many terms of trade that would make both Tom and Hank better off than if they didn't trade. But there are also terms that Tom or Hank would certainly reject. For example, Tom would not trade 2 fish per coconut, because he only gives up ⅓ fish per coconut without trade.

To find the range of mutually beneficial terms of trade for a coconut, look at each person's opportunity cost of producing a coconut. *Any price per coconut between the opportunity cost of the coconut producer and the opportunity cost of the coconut buyer will make both sides better off than in the absence of trade.* We know that Hank will produce coconuts because he has a comparative advantage in gathering coconuts. Hank's opportunity cost is ½ fish per coconut. Tom, the buyer of coconuts, has an opportunity cost of ⅓ fish per coconut. So any terms of trade between ½ fish per coconut and ⅓ fish per coconut would benefit both Tom and Hank.

To understand why, consider the opportunity costs summarized in Table 4.1. When Hank doesn't trade with Tom, Hank can gain ½ fish by giving up a coconut, because his opportunity cost of each coconut is ½ fish. Hank will clearly reject any deal with Tom that provides him with less than ½ fish per coconut—he's better off not trading at all and getting ½ fish per coconut. But Hank benefits from trade if he receives more than ½ fish per coconut. So the terms of 1 fish per coconut, as in our story, are acceptable to Hank.

When Tom doesn't trade with Hank, Tom gives up ⅓ fish to get a coconut—his opportunity cost of a coconut is ⅓ fish. Tom will reject any deal that requires him to pay more than ⅓ fish per coconut. But Tom benefits from trade if he pays less than ⅓ fish per coconut. The terms of 1 fish per coconut are thus acceptable to Tom as well. Both islanders would also be made better off by terms of ¾ fish per coconut or ⅝ fish per coconut or any other price between ½ fish and ⅓ fish per coconut. The islanders' negotiation skills determine where the terms of trade fall within that range.

So remember, Tom and Hank will engage in trade only if the "price" of the good each person obtains from trade is less than his own opportunity cost of producing the good. The same is true for international trade. Whenever two parties trade voluntarily, for each good, the terms of trade are found between the opportunity cost of the producer and the opportunity cost of the buyer.

The story of Tom and Hank clearly simplifies reality. Yet it teaches us some very important lessons that also apply to the real economy. First, the story provides a clear illustration of the gains from trade. By agreeing to specialize and provide goods to each other, Tom and Hank can produce more; therefore, both are better off than if each tried to be self-sufficient. Second, the story demonstrates a key point that is often overlooked in real-world arguments: as long as people have different opportunity costs, *everyone has a comparative advantage in something, and everyone has a comparative disadvantage in something, so everyone can benefit from trade.*

The idea of comparative advantage applies to many activities in the economy. Perhaps its most important application is in trade—not between individuals, but between countries. So let's look briefly at how the model of comparative advantage helps in understanding both the causes and the effects of international trade.

Comparative Advantage and International Trade

Look at the label on a manufactured good sold in the United States, and there's a good chance you will find that it was produced in some other country—in China or Japan or even in Canada. On the other hand, many U.S. industries sell a large portion of their output overseas. (This is particularly true for the agriculture, high technology, and entertainment industries.)

Should we celebrate this international exchange of goods and services, or should it cause us concern? Politicians and the public often question the desirability of

international trade, arguing that the nation should produce goods for itself rather than buy them from foreigners. Industries around the world demand protection from foreign competition: Japanese farmers want to keep out American rice, and American steelworkers want to keep out European steel. These demands are often supported by public opinion.

Economists, however, have a very positive view of international trade. Why? Because they view it in terms of comparative advantage. **Figure 4.3** shows, with a simple example, how international trade can be interpreted in terms of comparative advantage. Although the example is hypothetical, it is based on an actual pattern of international trade: American exports of pork to Canada and Canadian exports of aircraft to the United States. Panels (a) and (b) illustrate hypothetical production possibilities curves for the United States and Canada, with pork measured on the horizontal axis and aircraft measured on the vertical axis. The U.S. production possibilities curve is flatter than the Canadian production possibilities curve, implying that producing one more ton of pork costs fewer aircraft in the United States than it does in Canada. This means that the United States has a comparative advantage in pork and Canada has a comparative advantage in aircraft.

Although the consumption points in Figure 4.3 are hypothetical, they illustrate a general principle: just like the example of Tom and Hank, the United States and Canada can both achieve mutual gains from trade. If the United States concentrates on producing pork and sells some of its output to Canada, while Canada concentrates on aircraft and sells some of its output to the United States, both countries can consume more than if they insisted on being self-sufficient. For example, the United States could trade 1 million tons of pork for 1,500 aircraft from Canada. This would allow both countries to consume at a point outside of their production possibilities curves.

Moreover, these mutual gains don't depend on each country's being better at producing one kind of good. Even if one country has, say, higher output per person-hour in both industries—that is, even if one country has an absolute advantage in both industries—there are still mutual gains from trade.

Figure 4.3 Comparative Advantage and International Trade

(a) U.S. Production Possibilities Curve

(b) Canadian Production Possibilities Curve
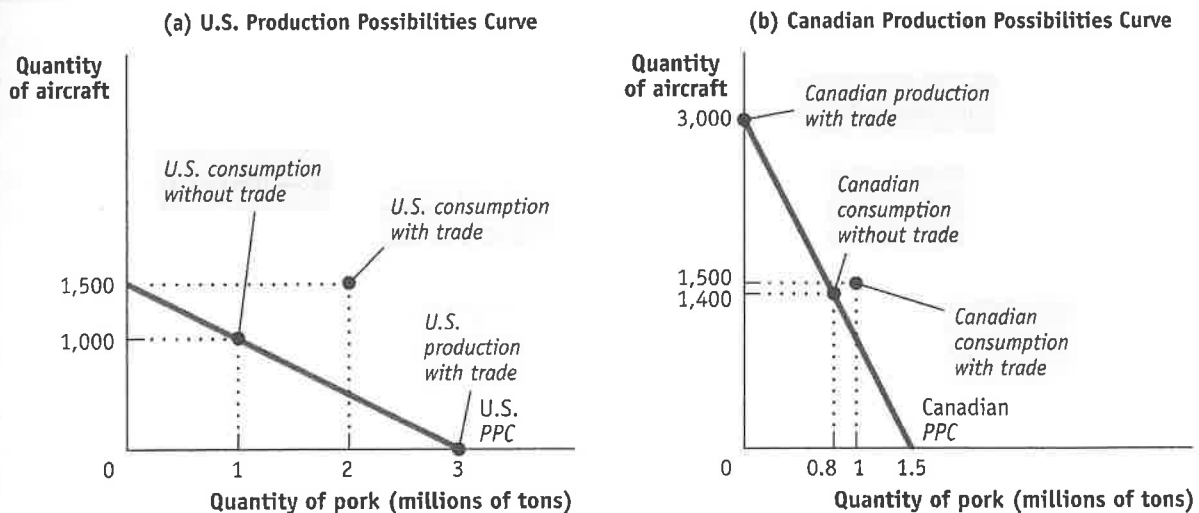
In this hypothetical example, Canada and the United States produce only two goods: pork and aircraft. Aircraft are measured on the vertical axis and pork on the horizontal axis. Panel (a) shows the U.S. production possibilities curve. It is relatively flat, implying that the United States has a comparative advantage in pork production. Panel (b) shows the Canadian production possibilities curve. It is relatively steep, implying that Canada has a comparative advantage in aircraft production. Just like two individuals, both countries gain from specialization and trade.

Try taking off your clothes—at a suitable time and in a suitable place, of course—and take a look at the labels inside that say where the clothes were made. It's a very good bet that much, if not most, of your clothing was manufactured overseas, in a country that is much poorer than the United States is—say, in El Salvador, Sri Lanka, or Bangladesh.

Why are these countries so much poorer than the United States? The immediate reason is that their economies are much less *productive*—firms in these countries are just not able to produce as much from a given quantity of resources as comparable firms in the United States or other wealthy countries. Why countries differ so much in productivity is a deep question—indeed, one of the main questions that preoccupy economists. But in any case, the difference in productivity is a fact.

If the economies of these countries are so much less productive than

ours, how is it that they make so much of our clothing? Why don't we do it for ourselves?

The answer is "comparative advantage." Just about every industry in Bangladesh is much less productive than the corresponding industry in the United States. But the productivity difference between rich and poor countries varies across goods; there is a very great difference in the production of sophisticated goods such as aircraft but not as great a difference in the production of simpler goods such as clothing. So Bangladesh's position with regard to clothing production is like Hank's position with respect to coconut gathering: he's not as good at it as his fellow castaway is, but it's the thing he does comparatively well.

Although Bangladesh is at an absolute disadvantage compared with the United States in almost everything, it has a comparative advantage in clothing production.

Although less productive than American workers, Bangladeshi workers have a comparative advantage in clothing production.

This means that both the United States and Bangladesh are able to consume more because they specialize in producing different things, with Bangladesh supplying our clothing and the United States supplying Bangladesh with more sophisticated goods.
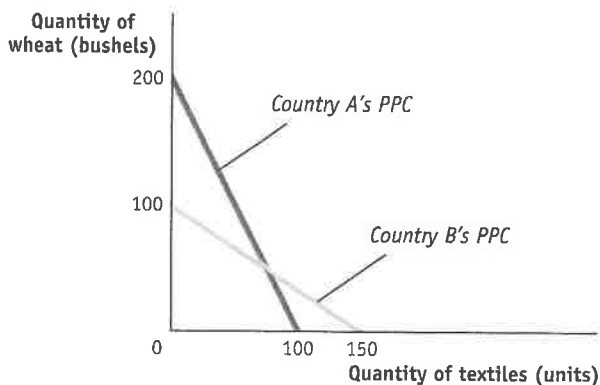
MODULE 4 Review

Check Your Understanding

1. In Italy, an automobile can be produced by 8 workers in one day and a washing machine by 3 workers in one day. In the United States, an automobile can be produced by 6 workers in one day, and a washing machine by 2 workers in one day.

   a. Which country has an absolute advantage in the production of automobiles? In washing machines?

   b. Which country has a comparative advantage in the production of washing machines? In automobiles?

   c. What type of specialization results in the greatest gains from trade between the two countries?

2. Refer to the story of Tom and Hank illustrated by Figure 4.1 in the text. Explain why Tom and Hank are willing to engage in a trade of 1 fish for 1½ coconuts.

Tackle the Test: Multiple-Choice Questions

Refer to the graph below to answer the following questions.

Quantity of wheat (bushels)

200 — Country A's PPC

100 — Country B's PPC

0 — 100 — 150

Quantity of textiles (units)

1. Use the graph to determine which country has an absolute advantage in producing each good.

Absolute advantage in wheat production	*Absolute advantage in textile production*
a. Country A	Country B
b. Country A	Country A
c. Country B	Country A
d. Country B	Country B
e. Country A	Neither country

2. For Country A, the opportunity cost of a bushel of wheat is
   a. ½ unit of textiles.
   b. ⅔ unit of textiles.
   c. 1⅓ units of textiles.
   d. 1½ units of textiles.
   e. 2 units of textiles.

3. Use the graph to determine which country has a comparative advantage in producing each good.

	Comparative advantage in wheat production	Comparative advantage in textile production
a.	Country A	Country B
b.	Country A	Country A
c.	Country B	Country A
d.	Country B	Country B
e.	Country A	Neither country

4. If the two countries specialize and trade, which of the choices below describes the countries' imports?

	Import wheat	Import textiles
a.	Country A	Country A
b.	Country A	Country B
c.	Country B	Country B
d.	Country B	Country A
e.	Neither country	Country B

5. What is the highest price Country B is willing to pay to buy wheat from Country A?
   a. ½ unit of textiles
   b. ⅔ unit of textiles
   c. 1 unit of textiles
   d. 1½ units of textiles
   e. 2 units of textiles

Tackle the Test: Free-Response Questions

1. Refer to the graph below to answer the following questions.
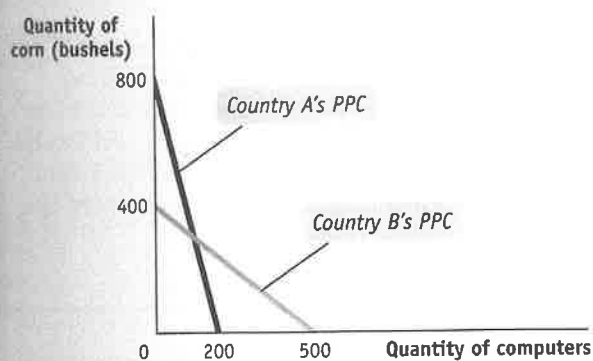
a. What is the opportunity cost of a bushel of corn in each country?
b. Which country has an absolute advantage in computer production? Explain.
c. Which country has a comparative advantage in corn production? Explain.
d. If each country specializes, what good will Country B import? Explain.
e. What is the minimum price Country A will accept to export corn to Country B? Explain.

Rubric for FRQ 1 (9 points)

1 point: Country A, ¼ computer; Country B, 1¼ computers

1 point: Country B

1 point: Because Country B can produce more computers than Country A (500 versus 200)

1 point: Country A

1 point: Because Country A can produce corn at a lower opportunity cost (¼ versus 1¼ computers)

1 point: Corn

1 point: Country B has a comparative advantage in the production of computers, so it will produce computers and import corn (Country A has a comparative advantage in corn production, so it will specialize in corn and import computers from Country B).

1 point: ¼ computer

1 point: Country A's opportunity cost of producing corn is ¼ computer, so that is the lowest price it will accept to sell corn to Country B.

2. Refer to the table below to answer the following questions. These two countries are producing textiles and wheat using equal amounts of resources.

	Weekly output per worker	
	Country A	Country B
Bushels of wheat	15	10
Units of textiles	60	60

a. What is the opportunity cost of producing a bushel of wheat for each country?
b. Which country has the absolute advantage in wheat production?
c. Which country has the comparative advantage in textile production? Explain.
(5 points)

Module 1

1. Everyone has to make choices about what to do and what *not* to do. **Individual choice** is the basis of **economics**—if it doesn't involve choice, it isn't economics. The **economy** is a system that coordinates choices about production and consumption. In a **market economy**, these choices are made by many firms and individuals. In a **command economy**, these choices are made by a central authority. **Incentives** are rewards or punishments that motivate particular choices, and can be lacking in a command economy where producers cannot set their own prices or keep their own profits. **Property rights** create incentives in market economies by establishing ownership and granting individuals the right to trade goods and services for mutual gain. In any economy, decisions are informed by **marginal analysis**—the study of the costs and benefits of doing something a little bit more or a little bit less.

2. The reason choices must be made is that **resources**—anything that can be used to produce something else—are **scarce.** The four categories of resources are **land**, **labor**, **capital**, and **entrepreneurship**. Individuals are limited in their choices by money and time; economies are limited by their supplies of resources.

3. Because you must choose among limited alternatives, the true cost of anything is what you must give up to get it—all costs are **opportunity costs**.

4. Economists use economic models for both **positive economics**, which describes how the economy works, and for **normative economics**, which prescribes how the economy *should* work. Positive economics often involves making forecasts. Economics can determine correct answers for positive questions, but typically not for normative questions, which involve value judgments. Exceptions occur when policies designed to achieve a certain prescription can be clearly ranked in terms of preference.

5. There are two main reasons economists disagree. One, they may disagree about which simplifications to make in a model. Two, economists may disagree—like everyone else—about values.

6. **Microeconomics** is the branch of economics that studies how people make decisions and how those decisions interact. **Macroeconomics** is concerned with the overall ups and downs of the economy, and focuses on **economic aggregates** such as the unemployment rate and gross domestic product, that summarize data across many different markets.

Module 2

7. Economies experience ups and downs in economic activity. This pattern is called the **business cycle**. The downturns are known as **recessions;** the upturns are known as **expansions**. A **depression** is a long, deep downturn.

8. Workers are counted in **unemployment** figures only if they are actively seeking work but aren't currently employed. The sum of **employment** and unemployment is the **labor force**. The **unemployment rate** is the percentage of the labor force that is unemployed.

9. As the unemployment rate rises, the output for the economy as a whole—the **aggregate output**—generally falls.

10. A short-term increase in aggregate output made possible by a decrease in unemployment does not constitute

economic growth, which is an increase in the maximum amount of output an economy can produce.

11. Rises and falls in the overall price level constitute **inflation** and **deflation**. Economists prefer that prices change only slowly if at all, because such **price stability** helps keep the economy stable.

12. Almost all economics is based on **models**, "thought experiments" or simplified versions of reality, many of which use analytical tools such as mathematics and graphs. An important assumption in economic models is the **other things equal (*ceteris paribus*) assumption**, which allows analysis of the effect of change in one factor by holding all other relevant factors unchanged.

Module 3

13. One important economic model is the **production possibilities curve**, which illustrates the **trade-offs** facing an economy that produces only two goods. The production possibilities curve illustrates three elements: opportunity cost (showing how much less of one good must be produced if more of the other good is produced), **efficiency** (an economy achieves **productive efficiency** if it produces

on the production possibilities curve and **allocative efficiency** if it produces the mix of goods and services that people want to consume), and economic growth (an outward shift of the production possibilities curve).

14. There are two basic sources of growth in the production possibilities curve model: an increase in resources and improved **technology**.

Module 4

15. There are **gains from trade**: by engaging in the **trade** of goods and services with one another, the members of an economy can all be made better off. Underlying gains from trade are the advantages of **specialization**, of having individuals specialize in the tasks they are comparatively good at.

16. **Comparative advantage** explains the source of gains from trade between individuals and countries. Everyone has a comparative advantage in something—some good or service in which that person has a lower opportunity cost than everyone else. But it is often confused

with **absolute advantage**, an ability to produce more of a particular good or service than anyone else. This confusion leads some to erroneously conclude that there are no gains from trade between people or countries.

17. As long as a comparative advantage exists between two parties, there are opportunities for mutually beneficial trade. The **terms of trade** indicate the rate at which one good can be exchanged for another. The range of mutually beneficial terms of trade for a good are found between the seller's opportunity cost of making the good and the buyer's opportunity cost of making the same good.

Key Terms

Economics, p. 2
Individual choice, p. 2
Economy, p. 2
Market economy, p. 2
Command economy, p. 2
Incentives, p. 3
Property rights, p. 3
Marginal analysis, p. 3
Resource, p. 3
Land, p. 3
Labor, p. 3
Capital, p. 3
Entrepreneurship, p. 3
Scarce, p. 3
Opportunity cost, p. 4
Microeconomics, p. 5
Macroeconomics, p. 5

Economic aggregates, p. 5
Positive economics, p. 6
Normative economics, p. 6
Business cycle, p. 11
Depression, p. 11
Recessions, p. 11
Expansions, p. 11
Employment, p. 11
Unemployment, p. 11
Labor force, p. 12
Unemployment rate, p. 12
Output, p. 12
Aggregate output, p. 12
Inflation, p. 13
Deflation, p. 13
Price stability, p. 13
Economic growth, p. 13

Model, p. 14
Other things equal (*ceteris paribus*) assumption, p. 14
Trade-off, p. 16
Production possibilities curve, p. 17
Efficient, p. 18
Productive efficiency, p. 18
Allocative efficiency, p. 18
Technology, p. 21
Trade, p. 24
Gains from trade, p. 24
Specialization, p. 24
Comparative advantage, p. 27
Absolute advantage, p. 27
Terms of trade, p. 28

AP Exam Practice Questions

Multiple-Choice Questions

1. In a market economy, most choices about production and consumption are made by which of the following?
   a. politicians
   b. many individuals and firms
   c. the government
   d. managers
   e. economists

2. Which of the following pairs indicates a category of resources and an example of that resource?

Category	Example
a. money	investment
b. capital	money
c. capital	minerals
d. land	factory
e. land	timber

3. You can either go to a movie or study for an exam. Which of the following is an opportunity cost of studying for the exam?
   a. a higher grade on the exam
   b. the price of a movie ticket
   c. the cost of paper, pens, books, and other study materials
   d. the enjoyment from seeing the movie
   e. the sense of achievement from learning

4. Which of the following situations is explained by increasing opportunity costs?
   a. More people go to college when the job market is good.
   b. More people do their own home repairs when hourly wages fall.
   c. There are more parks in crowded cities than in suburban areas.
   d. Convenience stores cater to busy people.
   e. People with higher wages are more likely to mow their own lawns.

5. Which of the following is a normative statement?
   a. The unemployment rate is expected to rise.
   b. Individuals purchase more of a good when the price rises.
   c. The government should increase the minimum wage.
   d. An increase in the tax rate on wage earnings reduces the incentive to work.
   e. Public education generates greater benefits than costs.

6. Falling output in an economy is consistent with which of the following?
   a. a recession
   b. an expansion
   c. a recovery
   d. falling unemployment
   e. long-term economic growth

7. Which of the following is a goal for the macroeconomy?
   a. declining labor force
   b. inflation
   c. deflation
   d. rising aggregate output
   e. rising unemployment rate

Refer to the following table and information for Questions 8–11.

Suppose that Atlantis is a small, isolated island in the South Atlantic. The inhabitants grow potatoes and catch fish. The following table shows the maximum annual output combinations of potatoes and fish that can be produced.

Maximum annual output options	Quantity of potatoes (pounds)	Quantity of fish (pounds)
A	1,000	0
B	800	300
C	600	500
D	400	600
E	200	650
F	0	675

8. Atlantis can produce which of the following combinations of output?

	Pounds of potatoes	Pounds of fish
a.	1,000	675
b.	600	600
c.	400	600
d.	300	800
e.	200	675

9. If Atlantis is efficient in production, what is the opportunity cost of increasing the annual output of potatoes from 600 to 800 pounds?
   a. 200 pounds of fish
   b. 300 pounds of fish
   c. 500 pounds of fish
   d. 675 pounds of fish
   e. 800 pounds of fish

10. As Atlantis produces more potatoes, what is true about the opportunity cost of producing potatoes?
   a. It stays the same.
   b. It continually increases.
   c. It continually decreases.
   d. It increases and then decreases.
   e. It decreases and then increases.

11. Which of the following combinations of output is efficient?

	Pounds of potatoes	Pounds of fish
a.	1,000	0
b.	600	600
c.	400	500
d.	500	400
e.	0	0

Refer to the following information for Questions 12–13.

In the ancient country of Roma, only two goods—spaghetti and meatballs—are produced. There are two tribes in Roma, the Tivoli and the Frivoli. By themselves, in a given month, the Tivoli can produce 30 pounds of spaghetti and no meatballs, 50 pounds of meatballs and no spaghetti, or any combination in between. In the same month, the Frivoli can produce 40 pounds of spaghetti and no meatballs, 30 pounds of meatballs and no spaghetti, or any combination in between.

12. Which tribe has a comparative advantage in meatball and spaghetti production?

	Meatballs	Spaghetti
a.	Tivoli	Tivoli
b.	Frivoli	Frivoli
c.	Tivoli	Frivoli
d.	Frivoli	Tivoli
e.	neither	both

13. In A.D. 100, the Frivoli discovered a new technique for making meatballs and doubled the quantity of meatballs they could produce each month. After the discovery of this new technique in Frivoli only, which tribe had an absolute advantage in meatball production and which had a comparative advantage in meatball production?

Absolute advantage	*Comparative advantage*
a. Tivoli	Tivoli
b. Frivoli	Frivoli
c. Tivoli	Frivoli
d. Frivoli	Tivoli
e. Frivoli	both

14. Which of the following is a basic source of economic growth in the production possibilities model?
   a. specialization
   b. efficiency
   c. opportunity cost
   d. trade-offs
   e. improved technology

15. Comparative advantage explains which of the following?
   a. a country's ability to produce more of a particular good or service
   b. when production is considered efficient
   c. why the production possibilities curve is bowed outward
   d. the source of gains from trade
   e. why the production possibilities curve shifts outward

Free-Response Question

The Hatfield family lives on the east side of the Hatatoochie River and the McCoy family lives on the west side. Each family's diet consists of fried chicken and corn on the cob, and each is self-sufficient, raising its own chickens and growing its own corn.

Assume the Hatfield family has a comparative advantage in the production of corn.

1. Draw a correctly labeled graph showing a hypothetical production possibilities curve for the McCoy family.
2. Which family has the comparative advantage in the production of chickens? Explain.
3. Assuming that each family is producing efficiently, how can the two families increase their consumption of both chicken and corn?
   (5 points)

Supply and Demand

Blue Jean Blues

If you bought a pair of blue jeans in 2012, you may have been shocked at the price. Or maybe not: fashions change, and maybe you thought you were paying the price for being fashionable. But you weren't—you were paying for cotton. Jeans are made of denim, a particular weave of cotton. In 2011, when jeans manufacturers were buying supplies for the coming year, the price of cotton climbed to more than triple its level just two years earlier. In March 2011, the price of a pound of cotton hit a 141-year high, the highest cotton price since record keeping began in 1870.

Why were cotton prices so high? On one side, demand for clothing of all kinds was surging. In 2008–2009, as the world struggled with the effects of a financial crisis, nervous consumers cut back on clothing purchases. But by 2011, with the worst apparently over, buyers were back in force. On the supply side, severe weather events hit world cotton production. Most notably, Pakistan, the world's fourth-largest cotton producer, was hit by devastating floods that put one-fifth of the country underwater and virtually destroyed its cotton crop.

Fearing that consumers had limited tolerance for large increases in the price of cotton clothing, apparel makers began scrambling to find ways to reduce costs without offending consumers' fashion sense. They adopted changes like smaller buttons, cheaper linings, and—yes—polyester, doubting that consumers would be willing to pay more for cotton goods. In fact, some experts on the cotton market warned that the sky-high prices of cotton in 2011 might lead to a permanent shift in tastes, with consumers becoming more willing to wear synthetics even when cotton prices came down.

At the same time, it was not all bad news for everyone connected with the cotton trade. In the United States, cotton producers had not been hit by bad weather and were relishing the higher prices. American farmers responded to the sky-high cotton prices by sharply increasing the acreage they devoted to the crop. None of these measures were enough, however, to produce immediate price relief.

Wait a minute: how, exactly, does flooding in Pakistan translate into higher jeans prices and more polyester in your T-shirts? It's a matter of supply and demand—but what does that mean? Many people use "supply and demand" as a catchphrase to mean "the laws of the marketplace at work." To economists, however, the concept of supply and demand has a precise meaning: it is a *model* of market behavior that is extremely useful for understanding many—but not all—markets.

In this section, we lay out the pieces that make up the *supply and demand model*, put them together, and show how this model can be used to understand how most markets behave.

MODULE 5

Supply and Demand: Introduction and Demand

In this Module, you will learn to:

- Explain what a competitive market is and how it is described by the supply and demand model
- Draw a demand curve and interpret its meaning
- Discuss the difference between movements along the demand curve and changes in demand
- List the factors that shift the demand curve

Supply and Demand: A Model of a Competitive Market

Cotton sellers and cotton buyers constitute a *market*—a group of producers and consumers who exchange a good or service for payment. In this section, we'll focus on a particular type of market known as a *competitive market*. Roughly, a **competitive market** is one in which there are many buyers and sellers of the same good or service. More precisely, the key feature of a competitive market is that no individual's actions have a noticeable effect on the price at which the good or service is sold. It's important to understand, however, that this is not an accurate description of every market. For example, it's not an accurate description of the market for cola beverages. That's because in the market for cola beverages, Coca-Cola and Pepsi account for such a large proportion of total sales that they are able to influence the price at which cola beverages are bought and sold. But it *is* an accurate description of the market for cotton. The global marketplace for cotton is so huge that even a jeans retailer as large as Levi Strauss & Co. accounts for only a tiny fraction of transactions, making it unable to influence the price at which cotton is bought and sold.

It's a little hard to explain why competitive markets are different from other markets until we've seen how a competitive market works. For now, let's just say that it's easier to model competitive markets than other markets. When taking an exam, it's always a good strategy to begin by answering the easier questions. In this book, we're going to do the same thing. So we will start with competitive markets.

A **competitive market** is a market in which there are many buyers and sellers of the same good or service, none of whom can influence the price at which the good or service is sold.

When a market is competitive, its behavior is well described by the **supply and demand model**. Because many markets *are* competitive, the supply and demand model is a very useful one indeed.

There are five key elements in this model:

- The *demand curve*
- The *supply curve*
- The set of factors that cause the demand curve to shift and the set of factors that cause the supply curve to shift
- The *market equilibrium*, which includes the *equilibrium price* and *equilibrium quantity*
- The way the market equilibrium changes when the supply curve or demand curve shifts

To explain the supply and demand model, we will examine each of these elements in turn. In this module we begin with demand.

The Demand Curve

How many pounds of cotton, packaged in the form of blue jeans, do consumers around the world want to buy in a given year? You might at first think that we can answer this question by multiplying the number of pairs of blue jeans purchased around the world each day by the amount of cotton it takes to make a pair of jeans, and then multiplying by 365. But that's not enough to answer the question because how many pairs of jeans—in other words, how many pounds of cotton—consumers want to buy depends on the price of cotton. When the price of cotton rises, as it did in 2011, some people will respond to the higher price of cotton clothing by buying fewer cotton garments or, perhaps, by switching completely to garments made from other materials, such as synthetics or linen. In general, the quantity of cotton clothing, or of any good or service that people want to buy (taking "want" to mean they are willing and able to buy it), depends on the price. The higher the price, the less of the good or service people want to purchase; alternatively, the lower the price, the more they want to purchase.

So the answer to the question "How many pounds of cotton do consumers want to buy?" depends on the price of a pound of cotton. If you don't yet know what the price will be, you can start by making a table of how many pounds of cotton people would want to buy at a number of different prices. Such a table is known as a *demand schedule*. This, in turn, can be used to draw a *demand curve*, which is one of the key elements of the supply and demand model.

The Demand Schedule and the Demand Curve

A **demand schedule** is a table that shows how much of a good or service consumers will want to buy at different prices. On the right side of **Figure 5.1**, we show a hypothetical demand schedule for cotton. It's hypothetical in that it doesn't use actual data on the world demand for cotton, and it assumes that all cotton is of equal quality.

According to the table, if cotton costs $1 a pound, consumers around the world will want to purchase 10 billion pounds of cotton over the course of a year. If the price is $1.25 a pound, they will want to buy only 8.9 billion pounds; if the price is only $0.75 a pound, they will want to buy 11.5 billion pounds; and so on. So the higher the price, the fewer pounds of cotton consumers will want to purchase. In other words, as the price rises, the **quantity demanded** of cotton—the actual amount consumers are willing and able to buy at some specific price—falls.

The graph in Figure 5.1 is a visual representation of the information in the table. The vertical axis shows the price of a pound of cotton and the horizontal axis shows the quantity of cotton in pounds. Each point on the graph corresponds to one of the

The **supply and demand model** is a model of how a competitive market works.

A **demand schedule** shows how much of a good or service consumers will be willing and able to buy at different prices.

The **quantity demanded** is the actual amount of a good or service consumers are willing and able to buy at some specific price.
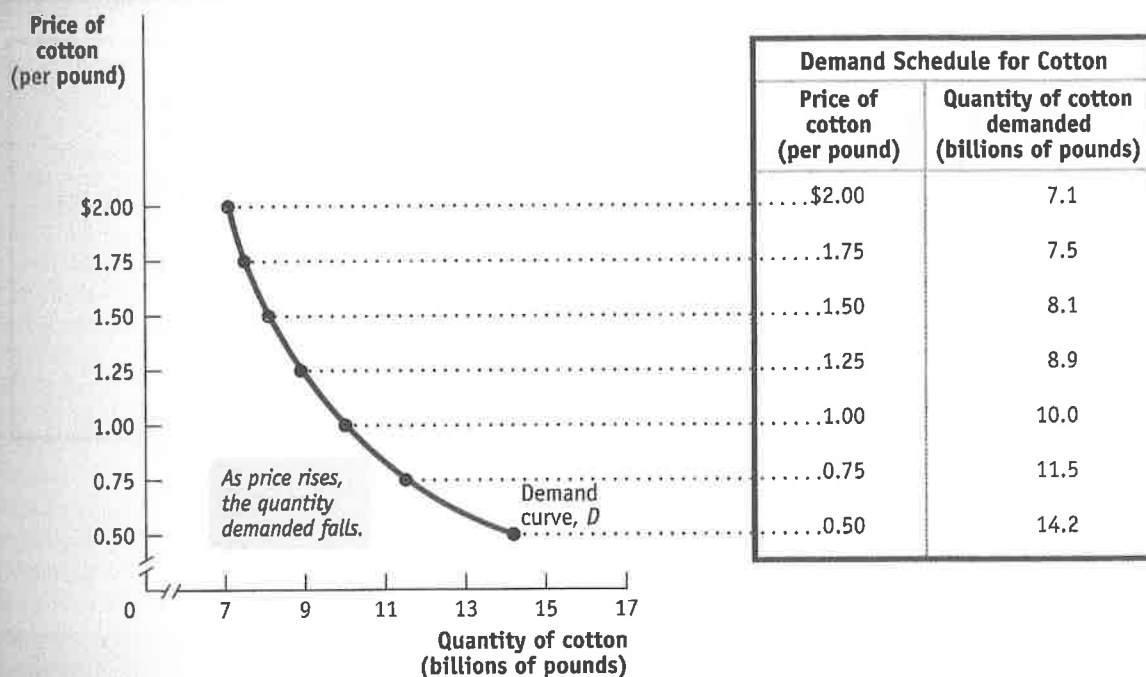
Figure 5.1 The Demand Schedule and the Demand Curve

Demand Schedule for Cotton

Price of cotton (per pound)	Quantity of cotton demanded (billions of pounds)
$2.00	7.1
1.75	7.5
1.50	8.1
1.25	8.9
1.00	10.0
0.75	11.5
0.50	14.2

The demand schedule for cotton yields the corresponding demand curve, which shows how much of a good or service consumers want to buy at any given price. The demand curve and the demand schedule reflect the law of demand: As price rises, the quantity demanded falls. Similarly, a decrease in price raises the quantity demanded. As a result, the demand curve is downward-sloping.

entries in the table. The curve that connects these points is a **demand curve**, a graphical representation of the demand schedule, which is another way of showing the relationship between the quantity demanded and the price.

Note that the demand curve shown in Figure 5.1 slopes downward. This reflects the general proposition that a higher price reduces the quantity demanded. For example, jeans-makers know they will sell fewer pairs of jeans when the price of jeans is higher, reflecting a $2 price per pound of cotton, compared to the number they will sell when the price of jeans is lower, reflecting a price of only $1 per pound of cotton. When the price of jeans is relatively high, some people buy pants less often, and some people buy pants made of wool, linen, or synthetics instead of cotton. In the real world, demand curves almost always slope downward. It is so likely that, all other things being equal, a higher price for a good will lead people to demand a smaller quantity of it, that economists are willing to call it a "law"—the **law of demand**.

Shifts of the Demand Curve

Even though cotton prices were higher in 2013 than they had been in 2012, total world consumption of cotton was higher in 2013. How can we reconcile this fact with the law of demand, which says that a higher price reduces the quantity demanded, all other things being equal?

The answer lies in the crucial phrase *all other things being equal*. In this case, all other things weren't equal: there were changes between 2012 and 2013 that increased the quantity of cotton demanded at any given price. For one thing, the world's population

A **demand curve** is a graphical representation of the demand schedule. It shows the relationship between quantity demanded and price.

The **law of demand** says that a higher price for a good or service, all other things being equal, leads people to demand a smaller quantity of that good or service.

AP® Exam Tip

In several common economics graphs including the graph of supply and demand, the dependent variable is on the vertical axis and the independent variable is on the horizontal axis. You learned the opposite convention in math and science classes, so graphing in economics may be a little difficult at first.

Figure 5.2 An Increase in Demand
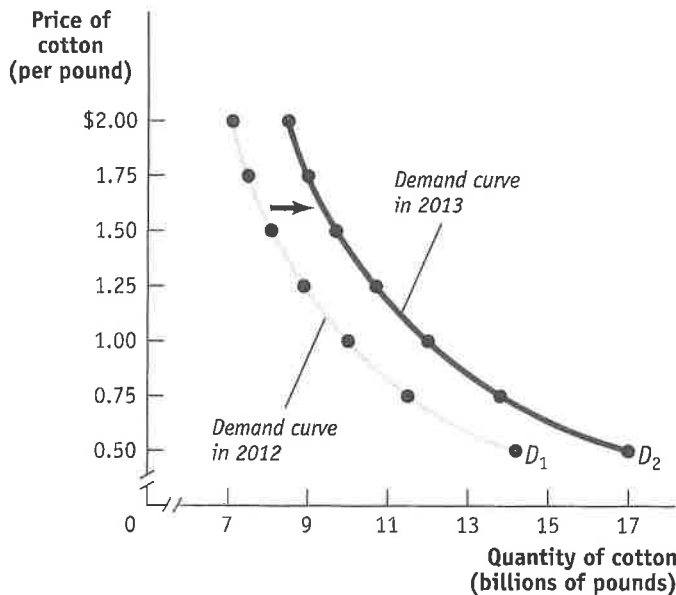
Demand Schedules for Cotton		
Price of cotton (per pound)	Quantity of cotton demanded (billions of pounds)	
	in 2012	in 2013
$2.00	7.1	8.5
1.75	7.5	9.0
1.50	8.1	9.7
1.25	8.9	10.7
1.00	10.0	12.0
0.75	11.5	13.8
0.50	14.2	17.0

Increases in population and income, among other changes, generate an increase in demand—a rise in the quantity demanded at any given price. This is represented by the two demand schedules—one showing demand in 2012, before the rise in population and income, the other showing demand in 2013, after the rise in population and income—and their corresponding demand curves. The increase in demand shifts the demand curve to the right.

A **change in demand** is a shift of the demand curve, which changes the quantity demanded at any given price.

A **movement along the demand curve** is a change in the quantity demanded of a good that is the result of a change in that good's price.

increased by 77 million, and therefore the number of potential wearers of cotton clothing increased. In addition, higher incomes in countries like China allowed people to buy more clothing than before. These changes led to an increase in the quantity of cotton demanded at any given price. **Figure 5.2** illustrates this phenomenon using the demand schedule and demand curve for cotton. (As before, the numbers in Figure 5.2 are hypothetical.)

The table in Figure 5.2 shows two demand schedules. The first is a demand schedule for 2012, the same one shown in Figure 5.1. The second is a demand schedule for 2013. It differs from the 2012 demand schedule due to factors such as a larger population and higher incomes, factors that led to an increase in the quantity of cotton demanded at any given price. So at each price, the 2013 schedule shows a larger quantity demanded than the 2012 schedule. For example, the quantity of cotton consumers wanted to buy at a price of $1 per pound increased from 10 billion to 12 billion pounds per year, the quantity demanded at $1.25 per pound went from 8.9 billion to 10.7 billion pounds, and so on.

What is clear from this example is that the changes that occurred between 2012 and 2013 generated a *new* demand schedule, one in which the quantity demanded was greater at any given price than in the original demand schedule. The two curves in Figure 5.2 show the same information graphically. As you can see, the demand schedule for 2013 corresponds to a new demand curve, D_2, that is to the right of the demand curve for 2012, D_1. This **change in demand** shows the increase in the quantity demanded at any given price, represented by the shift in position of the original demand curve, D_1, to its new location at D_2.

It's crucial to make the distinction between such changes in demand and **movements along the demand curve**, changes in the quantity demanded of a good that result from a change in that good's price. **Figure 5.3** illustrates the difference.

Figure 5.3   A Movement Along the Demand Curve Versus a Shift of the Demand Curve

The rise in the quantity demanded when going from point *A* to point *B* reflects a movement along the demand curve: it is the result of a fall in the price of the good. The rise in the quantity demanded when going from point *A* to point *C* reflects a change in demand: this shift to the right is the result of a rise in the quantity demanded at any given price.

A shift of the demand curve . . .

. . . is not the same thing as a movement along the demand curve.
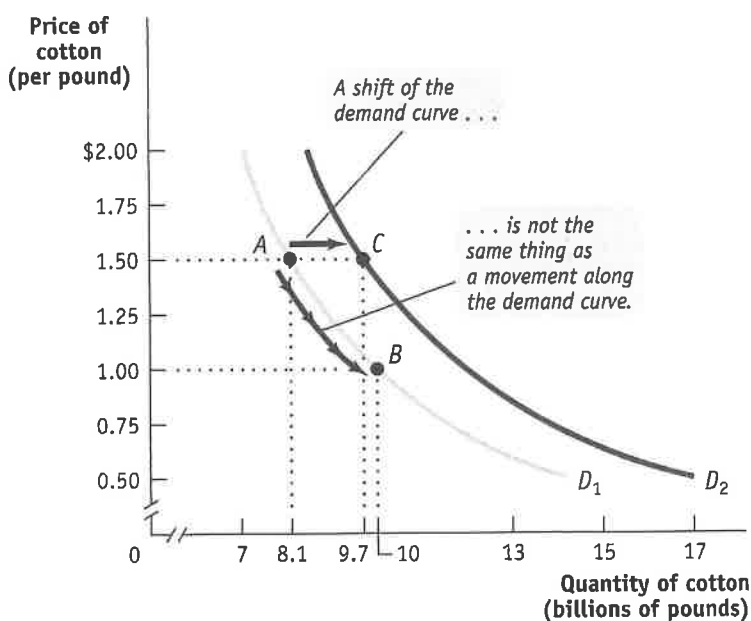
The movement from point *A* to point *B* is a movement along the demand curve: the quantity demanded rises due to a fall in price as you move down D_1. Here, a fall in the price of cotton from $1.50 to $1 per pound generates a rise in the quantity demanded from 8.1 billion to 10 billion pounds per year. But the quantity demanded can also rise when the price is unchanged if there is an *increase in demand*—a rightward shift of the demand curve. This is illustrated in Figure 5.3 by the shift of the demand curve from D_1 to D_2. Holding the price constant at $1.50 a pound, the quantity demanded rises from 8.1 billion pounds at point *A* on D_1 to 9.7 billion pounds at point *C* on D_2.

When economists talk about a "change in demand," saying "the demand for *X* increased" or "the demand for *Y* decreased," they mean that the demand curve for *X* or *Y* shifted—*not* that the quantity demanded rose or fell because of a change in the price.

Understanding Shifts of the Demand Curve

Figure 5.4 on the next page illustrates the two basic ways in which demand curves can shift. When economists talk about an "increase in demand," they mean a *rightward* shift of the demand curve: at any given price, consumers demand a larger quantity of the good or service than before. This is shown by the rightward shift of the original demand curve D_1 to D_2. And when economists talk about a "decrease in demand," they mean a *leftward* shift of the demand curve: at any given price, consumers demand a smaller quantity of the good or service than before. This is shown by the leftward shift of the original demand curve D_1 to D_3.

What caused the demand curve for cotton to shift? We have already mentioned two reasons: changes in population and income. If you think about it, you can come up with other things that would be likely to shift the demand curve for cotton. For example, suppose that the price of polyester rises. This will induce some people who previously bought polyester clothing to buy cotton clothing instead, increasing the demand for cotton.

AP® Exam Tip

When shifting curves, *left is less and right is more.*
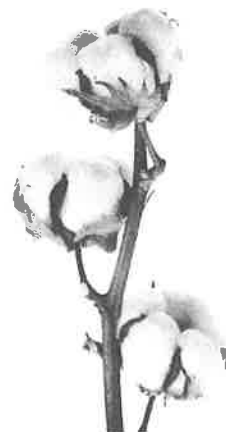
Figure 5.4 Shifts of the Demand Curve

Any event that increases demand shifts the demand curve to the right, reflecting a rise in the quantity demanded at any given price. Any event that decreases demand shifts the demand curve to the left, reflecting a fall in the quantity demanded at any given price.
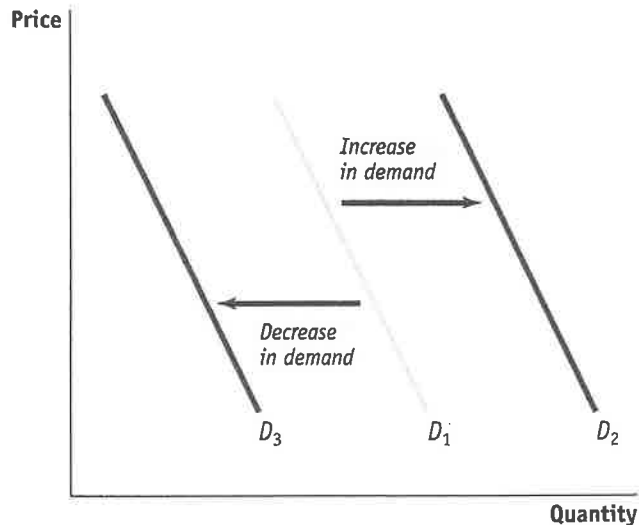
There are five principal factors that shift the demand curve for a good or service:

- Changes in the prices of related goods or services
- Changes in income
- Changes in tastes
- Changes in expectations
- Changes in the number of consumers

Although this is not an exhaustive list, it contains the five most important factors that can shift demand curves. So when we say that the quantity of a good or service demanded falls as its price rises, all other things being equal, we are in fact stating that the factors that shift demand are remaining unchanged. Let's now explore, in more detail, how those factors shift the demand curve.

Changes in the Prices of Related Goods or Services While there's nothing quite like a comfortable pair of all-cotton blue jeans, for some purposes khakis—typically made from polyester blends—aren't a bad alternative. Khakis are what economists call a *substitute* for jeans. A pair of goods are **substitutes** if a rise in the price of one good (jeans) makes consumers more willing to buy the other good (polyester-blend khakis). Substitutes are usually goods that in some way serve a similar function: coffee and tea, muffins and doughnuts, train rides and airplane rides. A rise in the price of the alternative good induces some consumers to purchase the original good *instead* of it, shifting demand for the original good to the right.

But sometimes a fall in the price of one good makes consumers *more* willing to buy another good. Such pairs of goods are known as **complements**. Complements are usually goods that in some sense are consumed together: computers and software, cookies and milk, cars and gasoline. Because consumers like to consume a good and its complement together, a change in the price of one of the goods will affect the demand for its complement. In particular, when the price of one good rises, the demand for its complement decreases, shifting the demand curve for the complement to the left. So a rise in the price of cookies is likely to precipitate a leftward shift in the demand curve for milk, as people consume fewer snacks of cookies and milk. Likewise, when the price of one good falls, the quantity demanded of its complement rises, shifting the demand curve for the complement to the right.

Two goods are **substitutes** if a rise in the price of one of the goods leads to an increase in the demand for the other good.

Two goods are **complements** if a rise in the price of one of the goods leads to a decrease in the demand for the other good.

This means that if, for some reason, the price of cookies falls, we should see a rightward shift in the demand curve for milk, as people consume more cookies *and* more milk.

Changes in Income When individuals have more income, they are normally more likely to purchase a good at any given price. For example, if a family's income rises, it is more likely to take that summer trip to Disney World—and therefore also more likely to buy plane tickets. So a rise in consumer incomes will cause the demand curves for most goods to shift to the right.

Why do we say "most goods," rather than "all goods"? Most goods are **normal goods**—the demand for them increases when consumer income rises. However, the demand for some products falls when income rises. Goods for which demand decreases when income rises are known as **inferior goods**. Usually an inferior good is one that is considered less desirable than more expensive alternatives—such as a bus ride versus a taxi ride. When they can afford to, people stop buying an inferior good and switch their consumption to the preferred, more expensive alternative. So when a good is inferior, a rise in income shifts the demand curve to the left. And, not surprisingly, a fall in income shifts the demand curve to the right.

One example of the distinction between normal and inferior goods that has drawn considerable attention in the business press is the difference between so-called casual-dining restaurants such as Applebee's and Olive Garden and fast-food chains such as McDonald's and KFC. When their incomes rise, Americans tend to eat out more at casual-dining restaurants. However, some of this increased dining out comes at the expense of fast-food venues—to some extent, people visit McDonald's less once they can afford to move upscale. So casual dining is a normal good, while fast-food appears to be an inferior good.

Changes in Tastes Why do people want what they want? Fortunately, we don't need to answer that question—we just need to acknowledge that people have certain preferences, or tastes, that determine what they choose to consume and that these tastes can change. Economists usually lump together changes in demand due to fads, beliefs, cultural shifts, and so on under the heading of changes in *tastes*, or *preferences*.

For example, once upon a time men wore hats. Up until around World War II, a respectable man wasn't fully dressed unless he wore a dignified hat along with his suit. But the returning soldiers adopted a more informal style, perhaps due to the rigors of the war. And President Eisenhower, who had been supreme commander of Allied Forces before becoming president, often went hatless. After World War II, it was clear that the demand curve for hats had shifted leftward, reflecting a decrease in the demand for hats.

Economists have little to say about the forces that influence consumers' tastes. (Marketers and advertisers, however, have plenty to say about them!) However, a *change* in tastes has a predictable impact on demand. When tastes change in favor of a good, more people want to buy it at any given price, so the demand curve shifts to the right. When tastes change against a good, fewer people want to buy it at any given price, so the demand curve shifts to the left.

Changes in Expectations When consumers have some choice about when to make a purchase, current demand for a good is often affected by expectations about its future price. For example, savvy shoppers often wait for seasonal sales—say, buying next year's holiday gifts during the post-holiday markdowns. In this case, expectations of a future drop in price lead to a decrease in demand today. Alternatively, expectations of a future rise in price are likely to cause an increase in demand today. For example, if you heard that the price of jeans would increase next year, you might go out and buy an extra pair now.

Changes in expectations about future income can also lead to changes in demand. If you learned today that you would inherit a large sum of money sometime in the future, you might borrow some money today and increase your demand for certain goods. On the other hand, if you learned that you would earn less in the future than you thought, you might reduce your demand for some goods and save more money today.
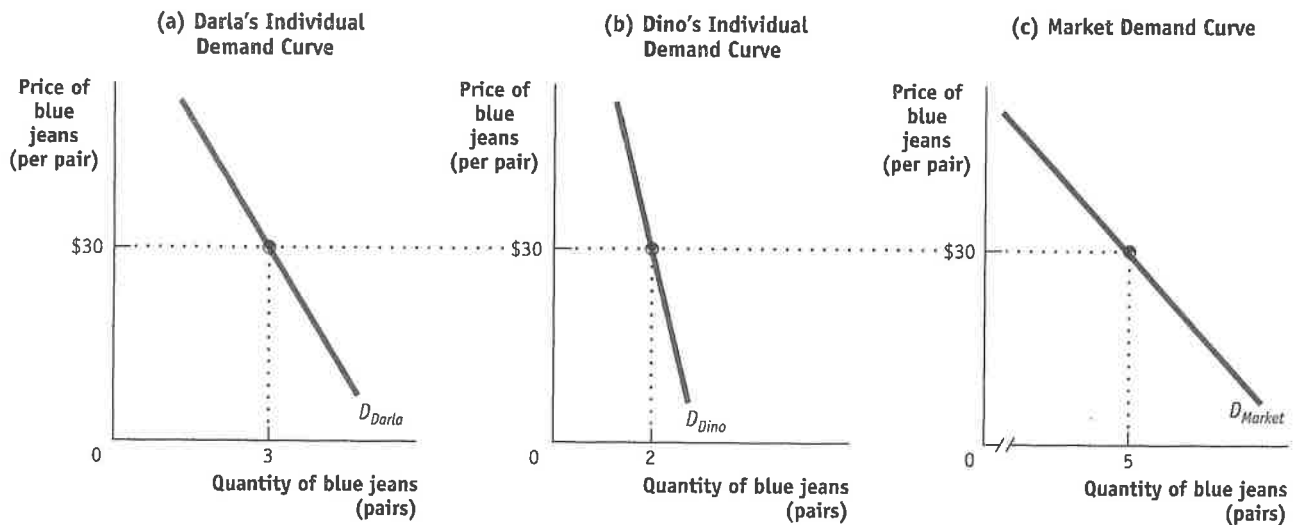
When a rise in income increases the demand for a good—the normal case—it is a **normal good**.

When a rise in income decreases the demand for a good, it is an **inferior good**.

Figure 5.5 Individual Demand Curves and the Market Demand Curve

(a) Darla's Individual Demand Curve

(b) Dino's Individual Demand Curve

(c) Market Demand Curve

Darla and Dino are the only two consumers of blue jeans in the market. Panel (a) shows Darla's individual demand curve: the number of pairs of jeans she will buy per year at any given price. Panel (b) shows Dino's individual demand curve. Given that Darla and Dino are the only two consumers, the *market demand* curve, which shows the quantity of blue jeans demanded by all consumers at any given price, is shown in panel (c). The market demand curve is the *horizontal sum* of the individual demand curves of all consumers. In this case, at any given price, the quantity demanded by the market is the sum of the quantities demanded by Darla and Dino.

Changes in the Number of Consumers As we've already noted, one of the reasons for rising cotton demand between 2012 and 2013 was a growing world population. Because of population growth, overall demand for cotton would have risen even if the demand of each individual wearer of cotton clothing had remained unchanged.
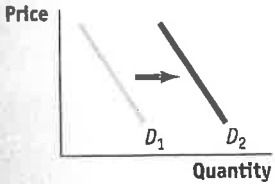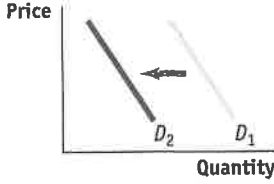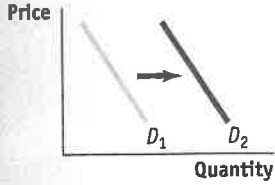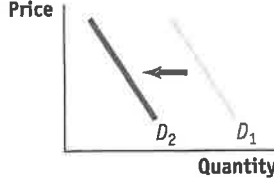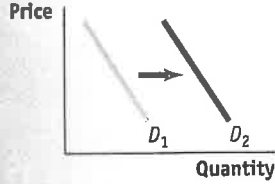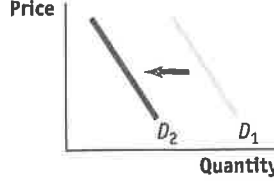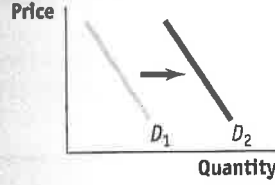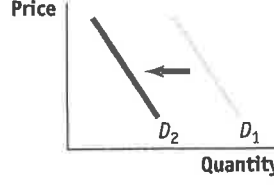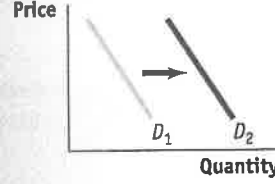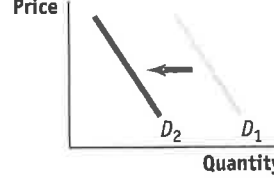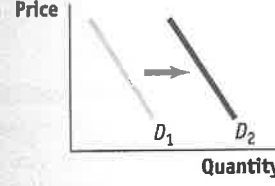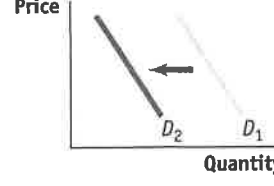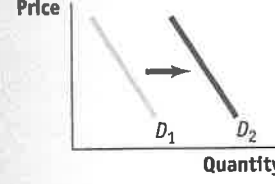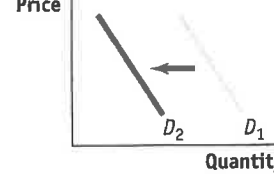
Let's introduce a new concept: the **individual demand curve**, which shows the relationship between quantity demanded and price for an individual consumer. For example, suppose that Darla is a consumer of cotton blue jeans; also suppose that all blue jeans are the same, so they sell for the same price. Panel (a) of **Figure 5.5** shows how many pairs of jeans she will buy per year at any given price per pound. Then D_{Darla} is Darla's individual demand curve.

The *market demand curve* shows how the combined quantity demanded by all consumers depends on the market price of that good. (Most of the time, when economists refer to the demand curve, they mean the market demand curve.) The market demand curve is the *horizontal sum* of the individual demand curves of all consumers in that market. To see what we mean by the term *horizontal sum*, assume for a moment that there are only two consumers of blue jeans, Darla and Dino. Dino's individual demand curve, D_{Dino}, is shown in panel (b). Panel (c) shows the market demand curve. At any given price, the quantity demanded by the market is the sum of the quantities demanded by Darla and Dino. For example, at a price of $30 per pair, Darla demands 3 pairs of jeans per year and Dino demands 2 pairs per year. So the quantity demanded by the market is 5 pairs per year.

Clearly, the quantity demanded by the market at any given price is larger with Dino present than it would be if Darla were the only consumer. The quantity demanded at any given price would be even larger if we added a third consumer, then a fourth, and so on. So an increase in the number of consumers leads to an increase in demand.

For an overview of the factors that shift demand, see **Table 5.1**.

Table 5.1 Factors That Shift Demand

When this happens . . .	. . . demand increases	But when this happens . . .	. . . demand decreases
When the price of a substitute rises . . .	Price / Quantity (D₁ → D₂) ...demand for the original good increases.	When the price of a substitute falls . . .	Price / Quantity (D₂ ← D₁) ...demand for the original good decreases.
When the price of a complement falls . . .	Price / Quantity (D₁ → D₂) ...demand for the original good increases.	When the price of a complement rises . . .	Price / Quantity (D₂ ← D₁) ...demand for the original good decreases.
When income rises . . .	Price / Quantity (D₁ → D₂) ...demand for a normal good increases.	When income falls . . .	Price / Quantity (D₂ ← D₁) ...demand for a normal good decreases.
When income falls . . .	Price / Quantity (D₁ → D₂) ...demand for an inferior good increases.	When income rises . . .	Price / Quantity (D₂ ← D₁) ...demand for an inferior good decreases.
When tastes change in favor of a good . . .	Price / Quantity (D₁ → D₂) ...demand for the good increases.	When tastes change against a good . . .	Price / Quantity (D₂ ← D₁) ...demand for the good decreases.
When the price is expected to rise in the future . . .	Price / Quantity (D₁ → D₂) ...demand for the good increases today.	When the price is expected to fall in the future . . .	Price / Quantity (D₂ ← D₁) ...demand for the good decreases today.
When the number of consumers rises . . .	Price / Quantity (D₁ → D₂) ...market demand for the good increases.	When the number of consumers falls . . .	Price / Quantity (D₂ ← D₁) ...market demand for the good decreases.

All big cities have traffic problems, and many local authorities try to discourage driving in the crowded city center. If we think of an auto trip to the city center as a good that people consume, we can use the economics of demand to analyze anti-traffic policies.

One common strategy of local governments is to reduce the demand for auto trips by lowering the prices of substitutes. Many metropolitan areas subsidize bus and rail service, hoping to lure commuters out of their cars.

An alternative strategy is to raise the price of complements: several major U.S. cities impose high taxes on commercial parking garages, both to raise revenue and to discourage people from driving into the city. High tolls for bridges and tunnels going into cities such as New York serve the same purposes.

However, few cities have been willing to adopt the politically controversial direct approach: reducing congestion by raising the price of simply driving in the city. So it was a shock when, in 2003, London imposed a "congestion charge" on all cars entering the city

center during business hours—currently £10 (about $16) for drivers who pay on the same day they travel.

Compliance is monitored with automatic cameras that photograph license plates. People can either pay the charge in advance or pay it by midnight of the day they have driven. If they pay on the day after they have driven, the charge increases to £12 (about $20). And if they don't pay and are caught, a fine of £130 (about $212) is imposed for each transgression. (A full description of the rules can be found at www.cclondon.com.)

Not surprisingly, the result of the new policy confirms the law of demand: three years after the charge was put in place, traffic in central London was about 10 percent lower than before the charge. In February 2007, the British government doubled the area of London covered by the congestion charge, and it suggested that it might institute congestion charging across the country by 2015. Several American and European municipalities, having seen the success of London's congestion charge, have said that they

are seriously considering adopting a congestion charge as well.

Congestion charging zone

Mon - Fri
7 am - 6 pm

London's bold policy to charge cars a fee to enter the city center proved effective in reducing traffic congestion.

MODULE 5 Review

Check Your Understanding

1. Explain whether each of the following events represents
   (i) a *change in demand* (a *shift* of the demand curve) or
   (ii) a *movement along* the demand curve (a *change in the quantity demanded*).
   a. A store owner finds that customers are willing to pay more for umbrellas on rainy days.
   b. When XYZ Telecom, a long-distance telephone service provider, offered reduced rates on weekends, its volume of weekend calling increased sharply.
   c. People buy more long-stem roses the week of Valentine's Day, even though the prices are higher than at other times during the year.
   d. A sharp rise in the price of gasoline leads many commuters to join carpools in order to reduce their gasoline purchases.

Tackle the Test: Multiple-Choice Questions

1. Which of the following would increase demand for a normal good? A decrease in
   a. price
   b. income
   c. the price of a substitute
   d. consumer taste for a good
   e. the price of a complement

2. A decrease in the price of butter would most likely decrease the demand for
   a. margarine.
   b. bagels.
   c. jelly.
   d. milk.
   e. syrup.

3. If an increase in income leads to a decrease in demand, the good is
   a. a complement.
   b. a substitute.
   c. inferior.
   d. abnormal.
   e. normal.

4. Which of the following will occur if consumers expect the price of a good to fall in the coming months?
   a. The quantity demanded will rise today.
   b. The quantity demanded will remain the same today.
   c. Demand will increase today.
   d. Demand will decrease today.
   e. No change will occur today.

5. Which of the following will increase the demand for disposable diapers?
   a. a new "baby boom"
   b. concern over the environmental effect of landfills
   c. a decrease in the price of cloth diapers
   d. a move toward earlier potty training of children
   e. a decrease in the price of disposable diapers

Tackle the Test: Free-Response Questions

1. Create a table with two hypothetical prices for a good and two corresponding quantities demanded. Choose the prices and quantities so that they illustrate the law of demand. Using your data, draw a correctly labeled graph showing the demand curve for the good. Using the same graph, illustrate an increase in demand for the good.

Rubric for FRQ 1 (6 points)
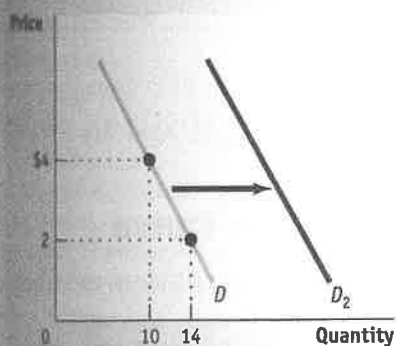
Price	Quantity
$4	10
2	14

1 point: Table with data labeled "Price" (or "P") and "Quantity" (or "Q")

1 point: Values in the table show a negative relationship between P and Q

1 point: Graph with "Price" on the vertical axis and "Quantity" on the horizontal axis

1 point: Negatively sloped curve labeled "Demand" or "D"

1 point: Demand curve correctly plots the data from the table

1 point: A second demand curve (with a label such as D_2) shown to the right of the original demand curve

2. Draw a correctly labeled graph showing the demand for apples. On your graph, illustrate what happens to the demand for apples if a new report from the Surgeon General finds that an apple a day really *does* keep the doctor away.

(3 points)

MODULE
6

Supply and Demand: Supply

In this Module, you will learn to:

- Draw a supply curve and interpret its meaning
- Discuss the difference between movements along the supply curve and changes in supply
- List the factors that shift the supply curve

The Supply Curve

Some parts of the world are especially well suited to growing cotton, and the United States is one of those. But even in the United States, some land is better suited to growing cotton than other land. Whether American farmers restrict their cotton-growing to only the most ideal locations or expand it to less suitable land depends on the price they expect to get for their cotton. Moreover, there are many other areas in the world where cotton could be grown—such as Pakistan, Brazil, Turkey, and China. Whether farmers there actually grow cotton depends, again, on the price.

So just as the quantity of cotton that consumers want to buy depends on the price they have to pay, the quantity that producers are willing to produce and sell—the **quantity supplied**—depends on the price they are offered.

The Supply Schedule and the Supply Curve

The table in **Figure 6.1** shows how the quantity of cotton made available varies with the price—that is, it shows a hypothetical **supply schedule** for cotton.

The **quantity supplied** is the actual amount of a good or service people are willing to sell at some specific price.

A **supply schedule** shows how much of a good or service producers would supply at different prices.

A **supply curve** shows the relationship between the quantity supplied and the price.

A supply schedule works the same way as the demand schedule shown in Figure 5.1: in this case, the table shows the number of pounds of cotton farmers are willing to sell at different prices. At a price of $0.50 per pound, farmers are willing to sell only 8 billion pounds of cotton per year. At $0.75 per pound, they're willing to sell 9.1 billion pounds. At $1, they're willing to sell 10 billion pounds, and so on.

In the same way that a demand schedule can be represented graphically by a demand curve, a supply schedule can be represented by a **supply curve**, as shown in Figure 6.1. Each point on the curve represents an entry from the table.

Suppose that the price of cotton rises from $1 to $1.25; we can see that the quantity of cotton farmers are willing to sell rises from 10 billion to 10.7 billion pounds. This is
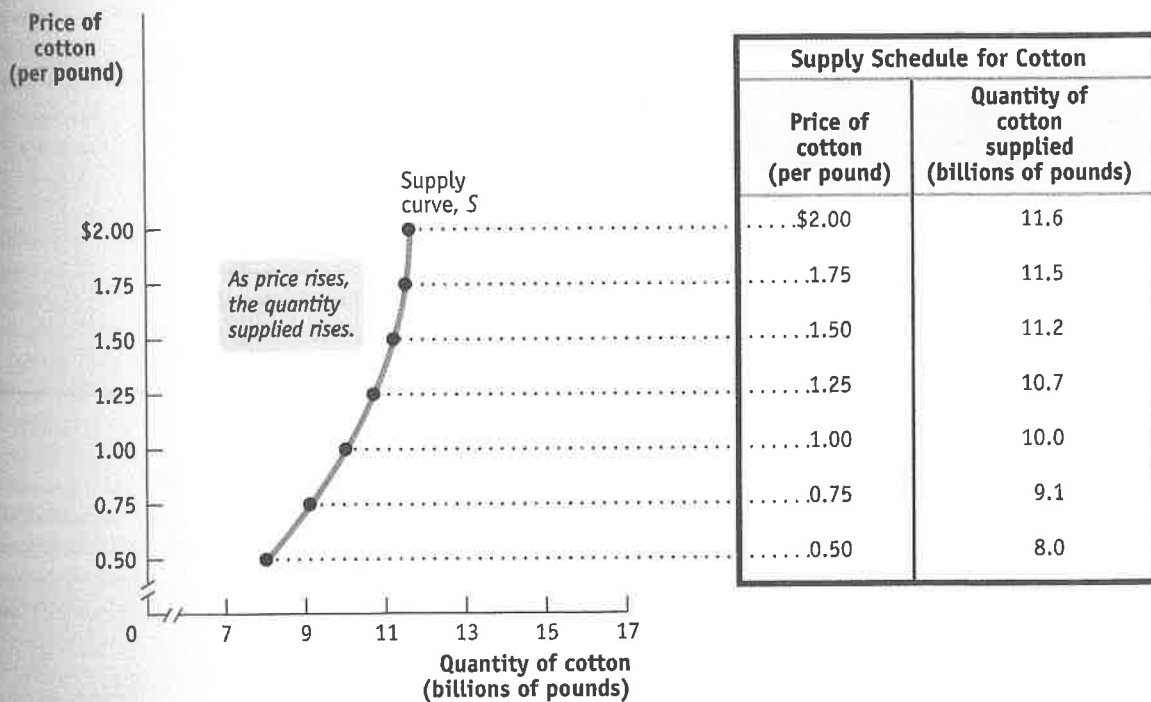
Figure 6.1 The Supply Schedule and the Supply Curve

Supply Schedule for Cotton	
Price of cotton (per pound)	Quantity of cotton supplied (billions of pounds)
.....$2.00	11.6
......1.75	11.5
......1.50	11.2
......1.25	10.7
......1.00	10.0
......0.75	9.1
......0.50	8.0

The supply schedule for cotton is plotted to yield the corresponding supply curve, which shows how much of a good producers are willing to sell at any given price. The supply curve and the supply schedule reflect the fact that supply curves are usually upward sloping: the quantity supplied rises when the price rises.

the normal situation for a supply curve, that a higher price leads to a higher quantity supplied. Some economists refer to this positive relationship as the **law of supply**. So just as demand curves normally slope downward, supply curves normally slope upward: the higher the price being offered, the more of any good or service producers will be willing to sell.

The **law of supply** says that, other things being equal, the price and quantity supplied of a good are positively related.

Shifts of the Supply Curve

Until recently, cotton remained relatively cheap over the past several decades. One reason is that the amount of land cultivated for cotton expanded over 35% from 1945 to 2007. However, the major factor accounting for cotton's relative cheapness was advances in the production technology, with output per acre more than quadrupling from 1945 to 2007. **Figure 6.2** on the next page illustrates these events in terms of the supply schedule and the supply curve for cotton.

The table in Figure 6.2 shows two supply schedules. The schedule before improved cotton-growing technology was adopted is the same one as in Figure 6.1. The second schedule shows the supply of cotton *after* the improved technology was adopted. Just as a change in demand schedules leads to a shift of the demand curve, a change in supply schedules leads to a shift of the supply curve—a **change in supply**. This is shown in Figure 6.2 by the shift of the supply curve before the adoption of new cotton-growing technology, S_1, to its new position after the adoption of new cotton-growing technology, S_2. Notice that S_2 lies to the right of S_1, a reflection of the fact that the quantity supplied rises at any given price.

The supply curve itself shows the relationship between the price and the quantity supplied, so you should not shift the supply curve to show the effect of a change in the price. When there is a change in a nonprice determinant of supply, such as production costs or the number of firms, supply changes and the supply curve shifts.

A **change in supply** is a shift of the supply curve, which changes the quantity supplied at any given price.

Figure 6.2   An Increase in Supply

Price of cotton (per pound)
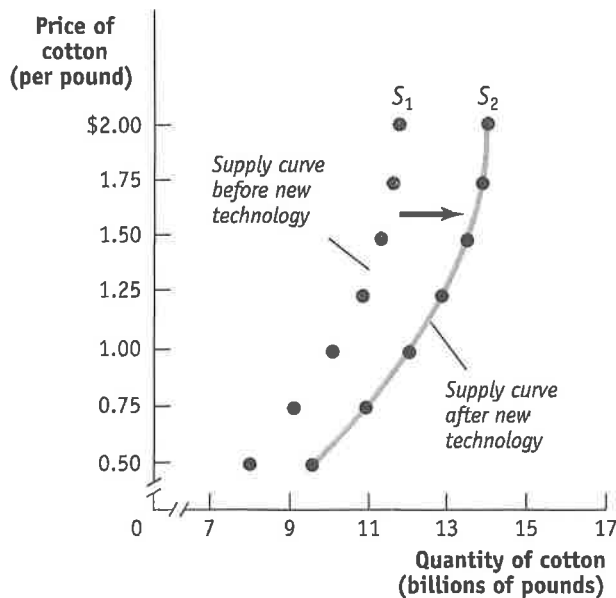
Supply Schedules for Cotton		
Price of cotton (per pound)	Quantity of cotton supplied (billions of pounds)	
	Before new technology	After new technology
$2.00	11.6	13.9
1.75	11.5	13.8
1.50	11.2	13.4
1.25	10.7	12.8
1.00	10.0	12.0
0.75	9.1	10.9
0.50	8.0	9.6

The adoption of improved cotton-growing technology generated an increase in supply—a rise in the quantity supplied at any given price. This event is represented by the two supply schedules—one showing supply before the new technology was adopted, the other showing supply after the new technology was adopted—and their corresponding supply curves. The increase in supply shifts the supply curve to the right.

A **movement along the supply curve** is a change in the quantity supplied of a good arising from a change in the good's price.

As in the analysis of demand, it's crucial to draw a distinction between such changes in supply and **movements along the supply curve**—changes in the quantity supplied arising from a change in price. We can see this difference in **Figure 6.3**. The movement from point A to point B is a movement along the supply curve: the quantity supplied rises along S_1 due to a rise in price. Here, a rise in price from $1 to $1.50 leads to a rise in the quantity supplied from 10 billion to 11.2 billion pounds of cotton. But the quantity supplied can also rise when the price is unchanged if there is an increase in supply— a rightward shift of the supply curve. This is shown by the rightward shift of the supply curve from S_1 to S_2. Holding the price constant at $1, the quantity supplied rises from 10 billion pounds at point A on S_1 to 12 billion pounds at point C on S_2.

Understanding Shifts of the Supply Curve

Figure 6.4 illustrates the two basic ways in which supply curves can shift. When economists talk about an "increase in supply," they mean a *rightward* shift of the supply curve: at any given price, producers supply a larger quantity of the good than before. This is shown in Figure 6.4 by the rightward shift of the original supply curve S_1 to S_2. And when economists talk about a "decrease in supply," they mean a *leftward* shift of the supply curve: at any given price, producers supply a smaller quantity of the good than before. This is represented by the leftward shift of S_1 to S_3.

Shifts of the supply curve for a good or service are mainly the result of five factors (though, as in the case of demand, there are other possible causes):
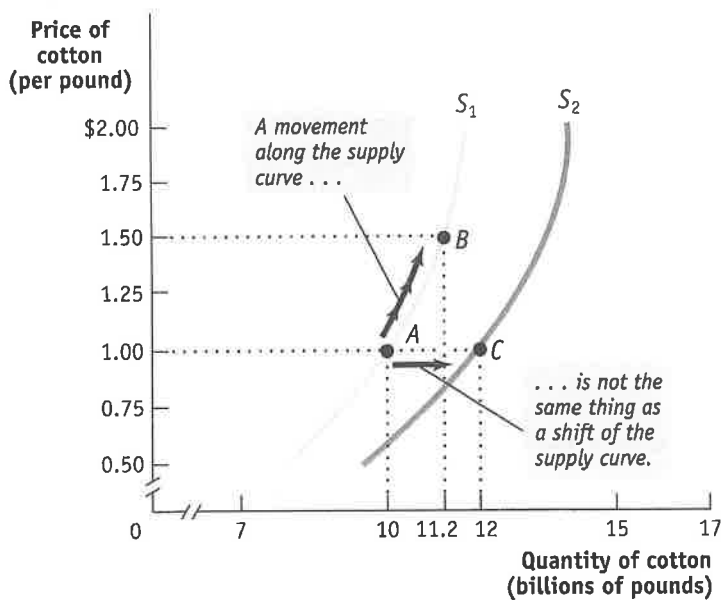
- Changes in input prices
- Changes in the prices of related goods or services

AP® Exam Tip

Looks can be deceiving. An increase in supply is not a shift down; it is a shift to the right, indicating an increase in the quantity supplied at every price. A decrease in supply is not a shift up, but a shift to the left, indicating a decrease in the quantity supplied at every price.

Figure 6.3 A Movement Along the Supply Curve Versus a Shift of the Supply Curve

The increase in quantity supplied when going from point *A* to point *B* reflects a movement along the supply curve: it is the result of a rise in the price of the good. The increase in quantity supplied when going from point *A* to point *C* reflects a shift of the supply curve: it is the result of an increase in the quantity supplied at any given price.


- Changes in technology
- Changes in expectations
- Changes in the number of producers

Changes in Input Prices To produce output, you need *inputs*. For example, to make vanilla ice cream, you need vanilla beans, cream, sugar, and so on. An **input** is any good or service that is used to produce another good or service. Inputs, like outputs, have prices. And an increase in the price of an input makes the production of the final

An **input** is a good or service that is used to produce another good or service.

Figure 6.4 Shifts of the Supply Curve

Any event that increases supply shifts the supply curve to the right, reflecting a rise in the quantity supplied at any given price. Any event that decreases supply shifts the supply curve to the left, reflecting a fall in the quantity supplied at any given price.
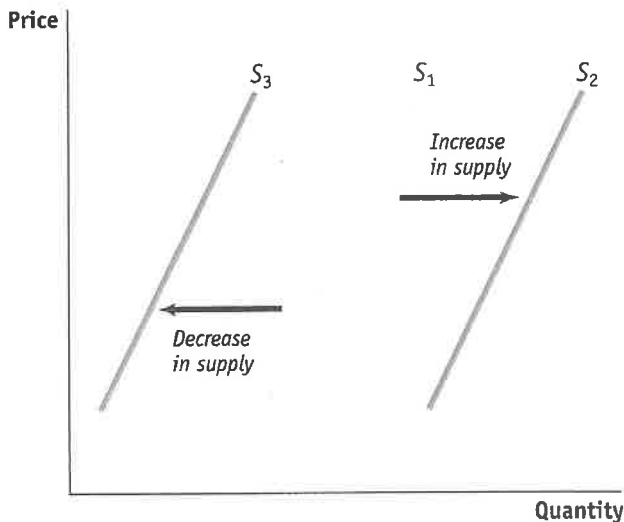
good more costly for those who produce and sell it. So producers are less willing to supply the final good at any given price, and the supply curve shifts to the left. For example, fuel is a major cost for airlines. When oil prices surged in 2007–2008, airlines began cutting back on their flight schedules and some went out of business. Similarly, a fall in the price of an input makes the production of the final good less costly for sellers. They are more willing to supply the good at any given price, and the supply curve shifts to the right.

Changes in the Prices of Related Goods or Services A single producer often produces a mix of goods rather than a single product. For example, an oil refinery produces gasoline from crude oil, but it also produces heating oil and other products from the same raw material. When a producer sells several products, the quantity of any one good it is willing to supply at any given price depends on the prices of its other co-produced goods.

This effect can run in either direction. An oil refiner will supply less gasoline at any given price when the price of heating oil rises, shifting the supply curve for gasoline to the left. But it will supply more gasoline at any given price when the price of heating oil falls, shifting the supply curve for gasoline to the right. This means that gasoline and other co-produced oil products are *substitutes in production* for refiners.

In contrast, due to the nature of the production process, other goods can be *complements in production*. For example, producers of crude oil—oil-well drillers—often find that oil wells also produce natural gas as a by-product of oil extraction. The higher the price at which a driller can sell its natural gas, the more oil wells it will drill and the more oil it will supply at any given price for oil. As a result, natural gas is a complement in production for crude oil.

Changes in Technology When economists talk about "technology," they don't necessarily mean high technology—they mean all the methods people can use to turn inputs into useful goods and services. In that sense, the whole complex sequence of activities that turn cotton from Pakistan into the pair of jeans hanging in your closet is technology.

Improvements in technology enable producers to spend less on inputs yet still produce the same output. When a better technology becomes available, reducing the cost of production, supply increases, and the supply curve shifts to the right. As we have already mentioned, improved technology enabled farmers to more than quadruple cotton output per acre planted over the past several decades. Improved technology is the main reason that, until recently, cotton remained relatively cheap even as worldwide demand grew.

Changes in Expectations Just as changes in expectations can shift the demand curve, they can also shift the supply curve. When suppliers have some choice about when they put their good up for sale, changes in the expected future price of the good can lead a supplier to supply less or more of the good today.

For example, consider the fact that gasoline and other oil products are often stored for significant periods of time at oil refineries before being sold to consumers. In fact, storage is normally part of producers' business strategy. Knowing that the demand for gasoline peaks in the summer, oil refiners normally store some of their gasoline produced during the spring for summer sale. Similarly, knowing that the demand for heating oil peaks in the winter, they normally store some of their heating oil produced during the fall for winter sale. In each case, there's a decision to be made between selling the product now versus storing it for later sale. Which choice a producer makes depends on a comparison of the current price versus the expected future price. This example illustrates how changes in expectations can alter supply: an increase in the anticipated future price of a good or service reduces supply today, a leftward shift of the supply curve. But a fall in the anticipated future price increases supply today, a rightward shift of the supply curve.

Changes in the Number of Producers Just as changes in the number of consumers affect the demand curve, changes in the number of producers affect the supply curve. Let's examine the **individual supply curve**, by looking at panel (a) in **Figure 6.5.** The individual supply curve shows the relationship between quantity supplied and price for an individual producer. For example, suppose that Mr. Silva is a Brazilian cotton farmer and that panel (a) of Figure 6.5 shows how many pounds of cotton he will supply per year at any given price. Then S_{Silva} is his individual supply curve.

The *market supply curve* shows how the combined total quantity supplied by all individual producers in the market depends on the market price of that good. Just as the market demand curve is the horizontal sum of the individual demand curves of all consumers, the market supply curve is the horizontal sum of the individual supply curves of all producers. Assume for a moment that there are only two producers of cotton, Mr. Silva and Mr. Liu, a Chinese cotton farmer. Mr. Liu's individual supply curve is shown in panel (b). Panel (c) shows the market supply curve. At any given price, the quantity supplied to the market is the sum of the quantities supplied by Mr. Silva and Mr. Liu. For example, at a price of $2 per pound, Mr. Silva supplies 3,000 pounds of cotton per year and Mr. Liu supplies 2,000 pounds per year, making the quantity supplied to the market 5,000 pounds.

Clearly, the quantity supplied to the market at any given price is larger with Mr. Liu present than it would be if Mr. Silva were the only supplier. The quantity supplied at a given price would be even larger if we added a third producer, then a fourth, and so on. So an increase in the number of producers leads to an increase in supply and a rightward shift of the supply curve.

For an overview of the factors that shift supply, see **Table 6.1** on the next page.

An **individual supply curve** illustrates the relationship between quantity supplied and price for an individual producer.

AP® Exam Tip

A mnemonic to help you remember the factors that shift supply is *HRENT*. Supply is shifted by changes in . . .
Input (resource) prices,
prices of Related goods and services,
Expectations,
the Number of producers, and
Technology.

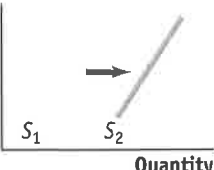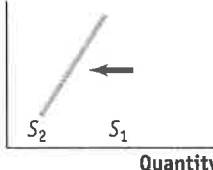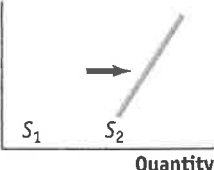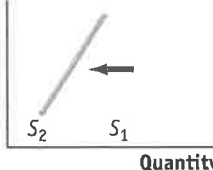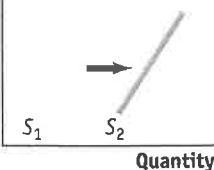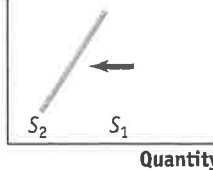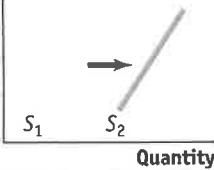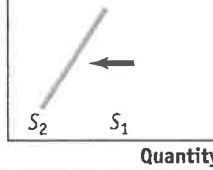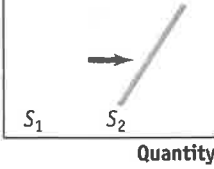## Figure 6.5   Individual Supply Curves and the Market Supply Curve

(a) Mr. Silva's Individual Supply Curve

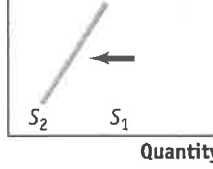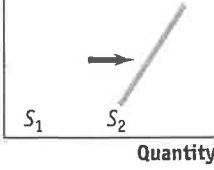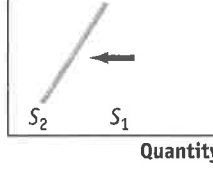(b) Mr. Liu's Individual Supply Curve

(c) Market Supply Curve
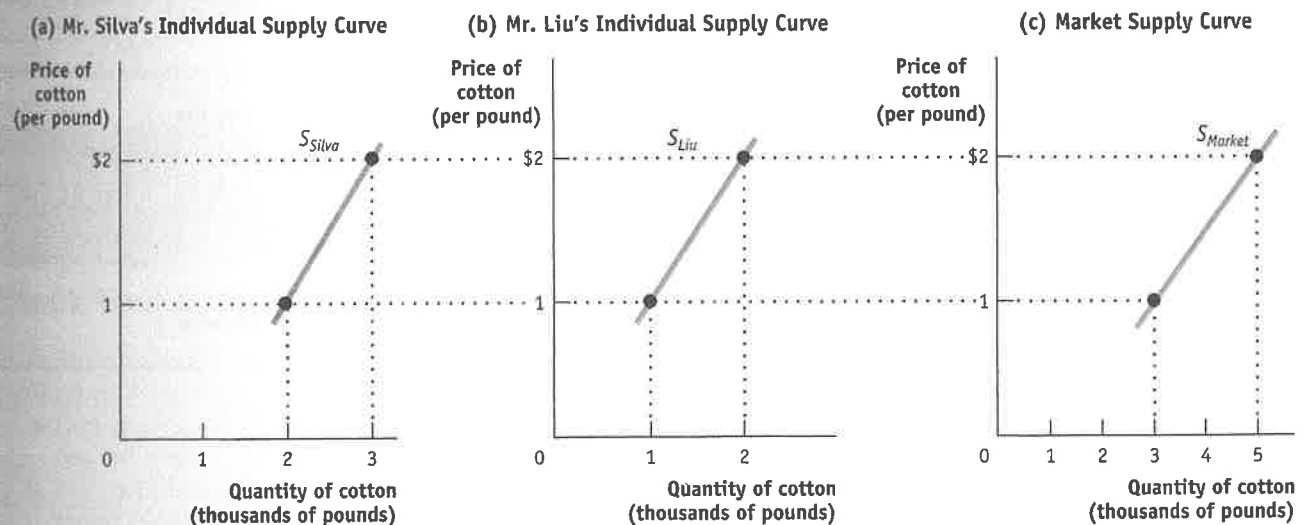
Panel (a) shows the individual supply curve for Mr. Silva, S_{Silva}, the quantity of cotton he will sell at any given price. Panel (b) shows the individual supply curve for Mr. Liu, S_{Liu}. The market supply curve, which shows the quantity of cotton supplied by all producers at any given price, is shown in panel (c). The market supply curve is the horizontal sum of the individual supply curves of all producers.

Table 6.1 Factors That Shift Supply

When this happens . . .	. . . supply increases	But when this happens . . .	. . . supply decreases
When the price of an input falls . . .	*[Graph: Price vs. Quantity, arrow shifting from S_1 to S_2]* . . . supply of the good increases.	When the price of an input rises . . .	*[Graph: Price vs. Quantity, arrow shifting from S_1 to S_2]* . . . supply of the good decreases.
When the price of a substitute in production falls . . .	*[Graph: Price vs. Quantity, arrow shifting from S_1 to S_2]* . . . supply of the original good increases.	When the price of a substitute in production rises . . .	*[Graph: Price vs. Quantity, arrow shifting from S_1 to S_2]* . . . supply of the original good decreases.
When the price of a complement in production rises . . .	*[Graph: Price vs. Quantity, arrow shifting from S_1 to S_2]* . . . supply of the original good increases.	When the price of a complement in production falls . . .	*[Graph: Price vs. Quantity, arrow shifting from S_1 to S_2]* . . . supply of the original good decreases.
When the technology used to produce the good improves . . .	*[Graph: Price vs. Quantity, arrow shifting from S_1 to S_2]* . . . supply of the good increases.	When the best technology used to produce the good is no longer available . . .	*[Graph: Price vs. Quantity, arrow shifting from S_1 to S_2]* . . . supply of the good decreases.
When the price is expected to fall in the future . . .	*[Graph: Price vs. Quantity, arrow shifting from S_1 to S_2]* . . . supply of the good increases today.	When the price is expected to rise in the future . . .	*[Graph: Price vs. Quantity, arrow shifting from S_1 to S_2]* . . . supply of the good decreases today.
When the number of producers rises . . .	*[Graph: Price vs. Quantity, arrow shifting from S_1 to S_2]* . . . market supply of the good increases.	When the number of producers falls . . .	*[Graph: Price vs. Quantity, arrow shifting from S_1 to S_2]* . . . market supply of the good decreases.

FYI — Only Creatures Small and Pampered

During the 1970s, British television featured a popular show titled *All Creatures Great and Small*. It chronicled the real life of James Herriot, a country veterinarian who tended to cows, pigs, sheep, horses, and the occasional house pet, often under arduous conditions, in rural England during the 1930s. The show made it clear that, in those days, the local vet was a critical member of farming communities, saving valuable farm animals and helping farmers survive financially. And it was also clear that Mr. Herriot considered his life's work well spent.

But that was then and this is now. According to a recent article in the *New York Times*, the United States has experienced a severe decline in the number of farm veterinarians over the past two decades. The source of the problem is competition. As the number of household pets has increased and the incomes of pet owners have grown, the demand for pet veterinarians has increased sharply. As a result, vets are being drawn away from the business of caring for farm animals into the more lucrative business of caring for pets. As one vet stated, she began her career caring for farm animals but changed her mind after "doing a C-section on a cow and it's 50 bucks. Do a C-section on a Chihuahua and you get $300. It's the money. I hate to say that."

How can we translate this into supply and demand curves? Farm veterinary services and pet veterinary services are like gasoline and fuel oil: they're related goods that are substitutes in production. A veterinarian typically specializes in one type of practice or the other, and that decision often depends on the going price for the service. America's growing pet population, combined with the increased willingness of doting owners to spend on their companions' care, has driven up the price of pet veterinary services. As a result, fewer and fewer veterinarians

have gone into farm animal practice. So the supply curve of farm veterinarians has shifted leftward—fewer farm veterinarians are offering their services at any given price.

In the end, farmers understand that it is all a matter of dollars and cents: they get fewer veterinarians because they are unwilling to pay more. As one farmer, who had recently lost an expensive cow due to the unavailability of a veterinarian, stated, "The fact that there's nothing you can do, you accept it as a business expense now. You didn't used to. If you have livestock, sooner or later you're going to have deadstock." (Although we should note that this farmer could have chosen to pay more for a vet who would then have saved his cow.)

Higher spending on pets means fewer veterinarians are available to tend to farm animals.

MODULE 6 Review

Check Your Understanding

1. Explain whether each of the following events represents (i) a *change in* supply or (ii) a *movement along* the supply curve.
   a. During a real estate boom that causes house prices to rise, more homeowners put their houses up for sale.
   b. Many strawberry farmers open temporary roadside stands during harvest season, even though prices are usually low at that time.
   c. Immediately after the school year begins, fewer young people are available to work. Fast-food chains must raise wages, which represent the price of labor, to attract workers.
   d. Many construction workers temporarily move to areas that have suffered hurricane damage, lured by higher wages.
   e. Since new technologies have made it possible to build larger cruise ships (which are cheaper to run per passenger), Caribbean cruise lines have offered more cabins, at lower prices, than before.

2. After each of the following events, will the supply curve for the good that is mentioned shift to the left, shift to the right, or remain unchanged?
   a. The coffee berry borer beetle destroys large quantities of coffee berries.
   b. Consumers demand more bike helmets than ever.
   c. The number of tea producers increases.
   d. The price of leather, an input in wallet production, increases.

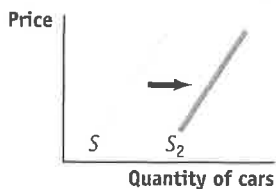# Tackle the Test: Multiple-Choice Questions

1. Which of the following will decrease the supply of rice?
   a. There is a technological advance that affects the production of *all* goods.
   b. The price of rice falls.
   c. The price of corn (which consumers regard as a substitute for rice) decreases.
   d. The wages of workers producing rice increase.
   e. The demand for rice decreases.

2. An increase in the demand for steak, which increases the price of steak, will lead to an increase in which of the following?
   a. the supply of steak
   b. the supply of hamburger (a substitute in production)
   c. the supply of chicken (a substitute in consumption)
   d. the supply of leather (a complement in production)
   e. the demand for leather

3. A technological advance in textbook production will lead to which of the following?
   a. a decrease in textbook supply
   b. an increase in textbook demand
   c. an increase in textbook supply
   d. a movement along the supply curve for textbooks
   e. an increase in textbook prices

4. Expectations among hiking boot makers that boot prices will rise significantly in the future will lead to which of the following now?
   a. an increase in boot supply
   b. no change in boot supply
   c. a decrease in boot supply
   d. a movement to the left along the boot supply curve
   e. a movement to the right along the boot supply curve

5. Starch from the stalks of potato plants is used to make packing peanuts, a complement in production. A decrease in potato demand that lowers potato prices will cause which of the following in the packing-peanut market?
   a. an increase in supply and no change in demand
   b. an increase in supply and a decrease in demand
   c. a decrease in both demand and supply
   d. a decrease in supply and no change in demand
   e. a decrease in supply and an increase in demand

Tackle the Test: Free-Response Questions

1. Tesla Motors makes sports cars powered by lithium batteries.
   a. Draw a correctly labeled graph showing a hypothetical supply curve for Tesla sports cars.
   b. On the same graph, show the effect of a major new discovery of lithium that lowers the price of lithium.
   c. Suppose Tesla Motors expects to be able to sell its cars for a higher price next month. Explain the effect that will have on the supply of Tesla cars this month.

Rubric for FRQ 1 (4 points)

Quantity of cars

1 point: Graph with "Price" or "P" on the vertical axis and "Quantity" or "Q" on the horizontal axis

1 point: Positively-sloped curve labeled "Supply" or "S"

1 point: A second supply curve shown to the right of the original supply curve with a label such as S_2 indicating that it is the new supply curve

1 point: Correct explanation that the expectation of higher prices next month would lead to a decrease in the supply of Tesla cars this month because the company will want to sell more of its cars when the price is higher

2. Suppose AP® Economics students at your school offer tutoring services to students in regular economics courses.
   a. Draw a correctly labeled graph showing the supply curve for tutoring services measured in hours. Label the supply curve "S_1".
   b. Suppose the wage paid for babysitting, an alternative activity for AP® Economics students, increases. Show the effect of this wage increase on the graph you drew for part a. Label the new supply curve "S_2".
   c. Suppose instead that the number of AP® Economics students increases. Show the effect of this increase in AP® Economics students on the same graph you drew for parts a and b. Label the new supply curve "S_3".

   (3 points)

MODULE 7

Supply and Demand: Equilibrium

In this Module, you will learn to:

- Explain how supply and demand curves determine a market's equilibrium price and equilibrium quantity
- Describe how price moves the market back to equilibrium in the case of a shortage or surplus

- Explain how equilibrium price and quantity are affected when there is a change in either supply or demand

- Explain how equilibrium price and quantity are affected when there is a simultaneous change in both supply and demand

Supply, Demand, and Equilibrium

We have now covered the first three key elements in the supply and demand model: the demand curve, the supply curve, and the set of factors that shift each curve. The next step is to put these elements together to show how they can be used to predict the actual price at which the good is bought and sold, as well as the actual quantity transacted.

In competitive markets this interaction of supply and demand tends to move toward what economists call *equilibrium*. Imagine a busy afternoon at your local supermarket; there are long lines at the checkout counters. Then one of the previously closed registers opens. The first thing that happens is a rush to the newly opened register. But soon enough things settle down and shoppers have rearranged themselves so that the line at the newly opened register is about as long as all the others. This situation—all the checkout lines are now the same length, and none of the shoppers can be better off by doing something different—is what economists call **equilibrium**.

The concept of equilibrium helps us understand the price at which a good or service is bought and sold as well as the quantity transacted of the good or service. A competitive market is in equilibrium when the price has moved to a level at which the quantity of a good demanded equals the quantity of that good supplied. At that price, no individual seller could make herself better off by offering to sell either more or less of the good and no individual buyer could make himself better off by offering to buy more or less of the good. Recall the shoppers at the supermarket who cannot make themselves better off (cannot save time) by changing lines. Similarly, at the market equilibrium, the price has moved to a level that exactly matches the quantity demanded by consumers to the quantity supplied by sellers.

An economic situation is in **equilibrium** when no individual would be better off doing something different.

AP® Exam Tip

Equilibrium is a term you will hear often throughout the course. When a market is in equilibrium, the quantity supplied equals the quantity demanded. There are no shortages or surpluses pushing the price up or down, and therefore there is no tendency for the price or the quantity to change.

The price that matches the quantity supplied and the quantity demanded is the **equilibrium price**; the quantity bought and sold at that price is the **equilibrium quantity**. The equilibrium price is also known as the **market-clearing price**: it is the price that "clears the market" by ensuring that every buyer willing to pay that price finds a seller willing to sell at that price, and vice versa. So how do we find the equilibrium price and quantity?

Finding the Equilibrium Price and Quantity

The easiest way to determine the equilibrium price and quantity in a market is by putting the supply curve and the demand curve on the same diagram. Since the supply curve shows the quantity supplied at any given price and the demand curve shows the quantity demanded at any given price, the price at which the two curves cross is the equilibrium price: the price at which quantity supplied equals quantity demanded.

Figure 7.1 combines the demand curve from Figure 5.1 and the supply curve from Figure 6.1. They *intersect* at point E, which is the equilibrium of this market; $1 is the equilibrium price and 10 billion pounds is the equilibrium quantity.

Let's confirm that point E fits our definition of equilibrium. At a price of $1 per pound, cotton farmers are willing to sell 10 billion pounds a year and cotton consumers want to buy 10 billion pounds a year. So at the price of $1 a pound, the quantity of cotton supplied equals the quantity demanded. Notice that at any other price the market would not clear: every willing buyer would not be able to find a willing seller, or vice versa. More specifically, if the price were more than $1, the quantity supplied would exceed the quantity demanded; if the price were less than $1, the quantity demanded would exceed the quantity supplied.

The model of supply and demand, then, predicts that given the demand and supply curves shown in Figure 7.1, 10 billion pounds of cotton would change

Figure 7.1   Market Equilibrium

Market equilibrium occurs at point E, where the supply curve and the demand curve intersect. In equilibrium, the quantity demanded is equal to the quantity supplied. In this market, the equilibrium price is $1 per pound and the equilibrium quantity is 10 billion pounds per year.
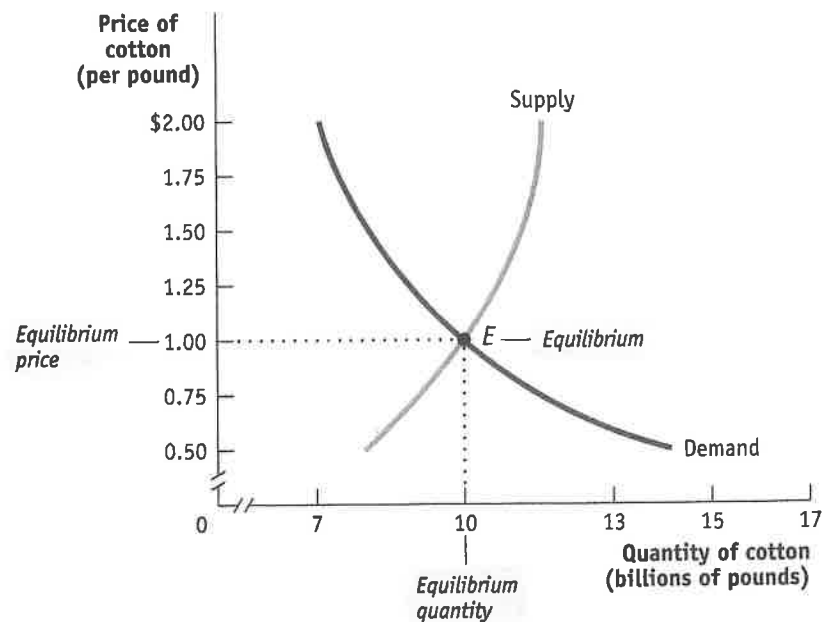
hands at a price of $1 per pound. But how can we be sure that the market will arrive at the equilibrium price? We begin by answering three simple questions:

1. Why do all sales and purchases in a market take place at the same price?
2. Why does the market price fall if it is above the equilibrium price?
3. Why does the market price rise if it is below the equilibrium price?

Why Do All Sales and Purchases in a Market Take Place at the Same Price?

There are some markets where the same good can sell for many different prices, depending on who is selling or who is buying. For example, have you ever bought a souvenir in a "tourist trap" and then seen the same item on sale somewhere else (perhaps even in the shop next door) for a lower price? Because tourists don't know which shops offer the best deals and don't have time for comparison shopping, sellers in tourist areas can charge different prices for the same good.

But in any market in which the buyers and sellers have both been around for some time, sales and purchases tend to converge at a generally uniform price, so we can safely talk about *the* market price. It's easy to see why. Suppose a seller offered a potential buyer a price noticeably above what the buyer knew other people were paying. The buyer would clearly be better off shopping elsewhere—unless the seller were prepared to offer a better deal. Conversely, a seller would not be willing to sell for significantly less than the amount he knew most buyers were paying; he would be better off waiting to get a more reasonable customer. So in any well-established, ongoing market, all sellers receive and all buyers pay approximately the same price. This is what we call the *market price*.

Why Does the Market Price Fall If It Is Above the Equilibrium Price?

Suppose the supply and demand curves are as shown in Figure 7.1 but the market price is above the equilibrium level of $1—say, $1.50. This situation is illustrated in Figure 7.2 on the next page. Why can't the price stay there?

As the figure shows, at a price of $1.50 there would be more pounds of cotton available than consumers wanted to buy: 11.2 billion pounds versus 8.1 billion pounds. The difference of 3.1 billion pounds is the **surplus**—also known as the *excess supply*—of cotton at $1.50.

This surplus means that some cotton farmers are frustrated: at the current price, they cannot find consumers who want to buy their cotton. The surplus offers an incentive for those frustrated would-be sellers to offer a lower price in order to poach business from other producers and entice more consumers to buy. The result of this price cutting will be to push the prevailing price down until it reaches the equilibrium price. So the price of a good will fall whenever there is a surplus—that is, whenever the market price is above its equilibrium level.

Why Does the Market Price Rise If It Is Below the Equilibrium Price?

Now suppose the price is below its equilibrium level—say, at $0.75 per pound, as shown in Figure 7.3 on the next page. In this case, the quantity demanded, 11.5 billion pounds, exceeds the quantity supplied, 9.1 billion pounds, implying that there are would-be buyers who cannot find cotton: there is a **shortage**, also known as an *excess demand*, of 2.4 billion pounds.

There is a **surplus** of a good or service when the quantity supplied exceeds the quantity demanded. Surpluses occur when the price is above its equilibrium level.

There is a **shortage** of a good or service when the quantity demanded exceeds the quantity supplied. Shortages occur when the price is below its equilibrium level.

YEAH, I KNOW IT'S PRICEY, BUT I ONLY GOTTA SELL *ONE* GLASS AND I'M SET FOR LIFE.

Lemonade $1,000,000 a glass

© Dan Piraro

Figure 7.2 Price Above Its Equilibrium Level Creates a Surplus

The market price of $1.50 is above the equilibrium price of $1. This creates a surplus: at a price of $1.50, producers would like to sell 11.2 billion pounds but consumers want to buy only 8.1 billion pounds, so there is a surplus of 3.1 billion pounds. This surplus will push the price down until it reaches the equilibrium price of $1.
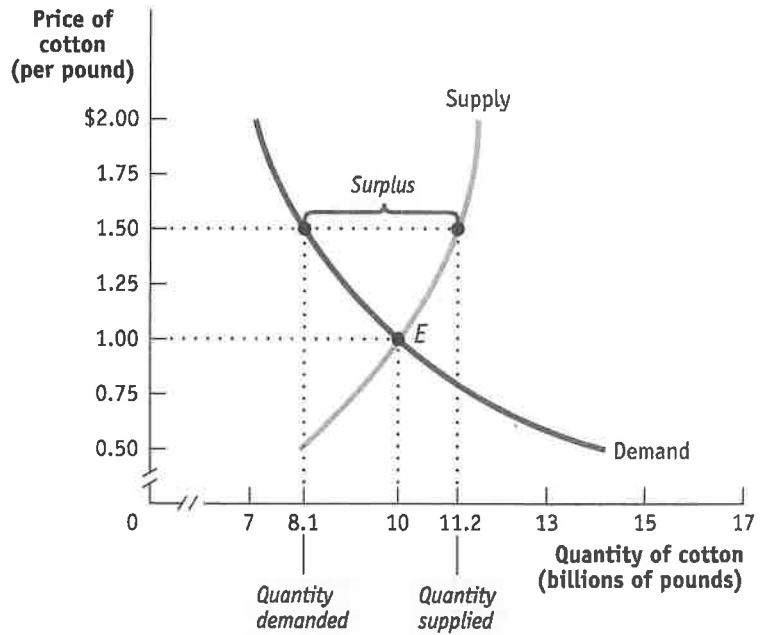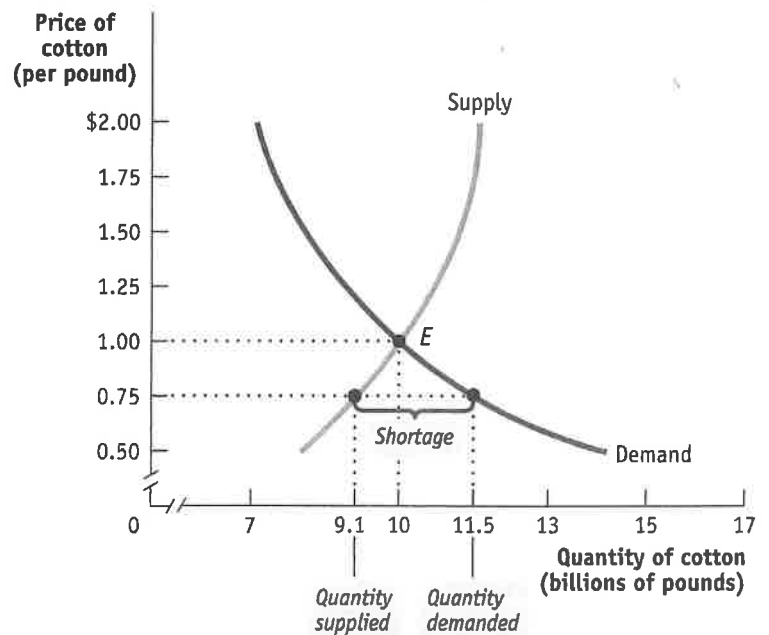

Figure 7.3 Price Below Its Equilibrium Level Creates a Shortage

The market price of $0.75 is below the equilibrium price of $1. This creates a shortage: consumers want to buy 11.5 billion pounds, but only 9.1 billion pounds are for sale, so there is a shortage of 2.4 billion pounds. This shortage will push the price up until it reaches the equilibrium price of $1.

FYI

The Price of Admission

The market equilibrium, so the theory goes, is pretty egalitarian because the equilibrium price applies to everyone. That is, all buyers pay the same price—the equilibrium price—and all sellers receive that same price. But is this realistic?

The market for concert tickets is an example that seems to contradict the theory—there's one price at the box office, and there's another price (typically much higher) for the same event on Internet sites where people who already have tickets resell them, such as StubHub.com or eBay. For example, compare the box office price for a recent Drake concert in Miami, Florida, to the StubHub.com price for seats in the same location: $88.50 versus $155.

Puzzling as this may seem, there is no contradiction once we take opportunity costs and tastes into account. For major events, buying tickets from the box office means waiting in very long lines. Ticket buyers who use Internet resellers have decided that the opportunity cost of their time is too high to spend waiting in line. And

tickets for major events being sold at face value by online box offices often sell out within minutes. In this case, some people who want to go to the concert badly but have missed out on the opportunity to buy cheaper tickets from the online box office are willing to pay the higher Internet reseller price.

Not only that—perusing the StubHub.com website, you can see that markets really do move to equilibrium. You'll notice that the prices quoted by different sellers for seats close to one another are also very close: $184.99 versus $185 for seats on the main floor of the Drake concert. As the competitive market model predicts, units of the same good end up selling for the same price. And prices move in response to demand and supply. According to an article in the New York Times, tickets on StubHub.com can sell for less than the face value for events with little appeal, but prices can skyrocket for events that are in high demand. (The article quotes a price of $3,530 for a Madonna

concert.) Even StubHub.com's chief executive says his site is "the embodiment of supply-and-demand economics."

So the theory of competitive markets isn't just speculation. If you want to experience it for yourself, try buying tickets to a concert.

The competitive market model determines the price you pay for concert tickets.

When there is a shortage, there are frustrated would-be buyers—people who want to purchase cotton but cannot find willing sellers at the current price. In this situation, either buyers will offer more than the prevailing price or sellers will realize that they can charge higher prices. Either way, the result is to drive up the prevailing price. This bidding up of prices happens whenever there are shortages—and there will be shortages whenever the price is below its equilibrium level. So the market price will always rise if it is below the equilibrium level.

Using Equilibrium to Describe Markets

We have now seen that a market tends to have a single price, the equilibrium price. If the market price is above the equilibrium level, the ensuing surplus leads buyers and sellers to take actions that lower the price. And if the market price is below the equilibrium level, the ensuing shortage leads buyers and sellers to take actions that raise the price. So the market price always *moves toward* the equilibrium price, the price at which there is neither surplus nor shortage.

Changes in Supply and Demand

The 2010 floods in Pakistan came as a surprise, but the subsequent increase in the price of cotton was no surprise at all. Suddenly there was a fall in supply: the quantity of cotton available at any given price fell. Predictably, a fall in supply raises the equilibrium price.

The flooding in Pakistan is an example of an event that shifted the supply curve for a good without having much effect on the demand curve. There are many such events. There are also events that shift the demand curve without shifting the supply curve. For example, a medical report that chocolate is good for you increases the demand for chocolate but does not affect the supply. Events often shift either the supply curve or the demand curve, but not both; it is therefore useful to ask what happens in each case.

We have seen that when a curve shifts, the equilibrium price and quantity change. We will now concentrate on exactly how the shift of a curve alters the equilibrium price and quantity.

What Happens When the Demand Curve Shifts

Cotton and polyester are substitutes: if the price of polyester rises, the demand for cotton will increase, and if the price of polyester falls, the demand for cotton will decrease. But how does the price of polyester affect the *market equilibrium* for cotton?

Figure 7.4 shows the effect of a rise in the price of polyester on the market for cotton. The rise in the price of polyester increases the demand for cotton. Point E_1 shows the equilibrium corresponding to the original demand curve, with P_1 the equilibrium price and Q_1 the equilibrium quantity bought and sold.

An increase in demand is indicated by a *rightward* shift of the demand curve from D_1 to D_2. At the original market price P_1, this market is no longer in equilibrium: a shortage occurs because the quantity demanded exceeds the quantity supplied. So the price of cotton rises and generates an increase in the quantity supplied, an upward *movement along the supply curve*. A new equilibrium is established at point E_2, with a higher equilibrium price, P_2, and higher equilibrium quantity, Q_2. This sequence of events reflects a general principle: *When demand for a good or service increases, the equilibrium price and the equilibrium quantity of the good or service both rise.*

What would happen in the reverse case, a fall in the price of polyester? A fall in the price of polyester reduces the demand for cotton, shifting the demand curve to the *left*. At the original price, a surplus occurs as quantity supplied exceeds quantity demanded. The price falls and leads to a decrease in the quantity supplied, resulting in a lower

Figure 7.4 Equilibrium and Shifts of the Demand Curve

The original equilibrium in the market for cotton is at E_1, at the intersection of the supply curve and the original demand curve, D_1. A rise in the price of polyester, a substitute, shifts the demand curve rightward to D_2. A shortage exists at the original price, P_1, causing both the price and quantity supplied to rise, a movement along the supply curve. A new equilibrium is reached at E_2, with a higher equilibrium price, P_2, and a higher equilibrium quantity, Q_2. When demand for a good or service increases, the equilibrium price and the equilibrium quantity of the good or service both rise.
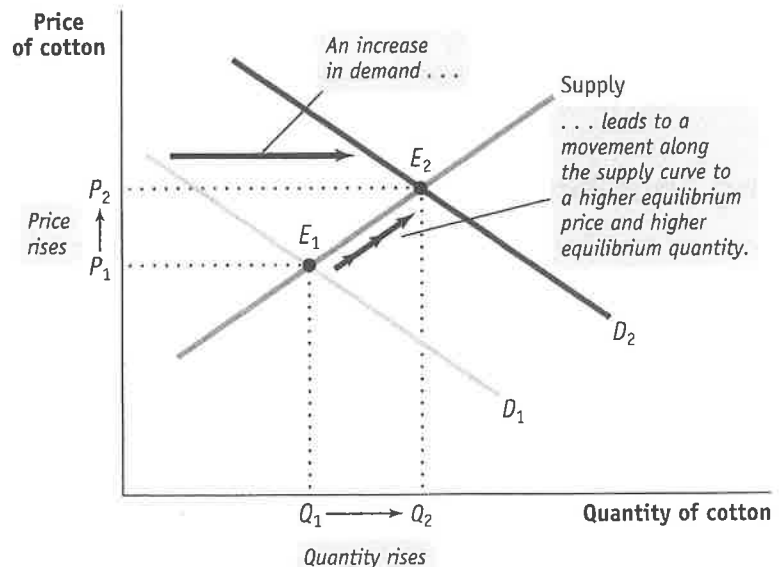
equilibrium price and a lower equilibrium quantity. This illustrates another general principle: *When demand for a good or service decreases, the equilibrium price and the equilibrium quantity of the good or service both fall.*

To summarize how a market responds to a change in demand: *An increase in demand leads to a rise in both the equilibrium price and the equilibrium quantity. A decrease in demand leads to a fall in both the equilibrium price and the equilibrium quantity.*

## What Happens When the Supply Curve Shifts

In the real world, it is a bit easier to predict changes in supply than changes in demand. Physical factors that affect supply, like weather or the availability of inputs, are easier to get a handle on than the fickle tastes that affect demand. Still, with supply as with demand, what we can best predict are the *effects* of shifts of the supply curve.

As we mentioned earlier, devastating floods in Pakistan sharply reduced the supply of cotton in 2010. **Figure 7.5** shows how this shift affected the market equilibrium. The original equilibrium is at E_1, the point of intersection of the original supply curve, S_1, and the demand curve, with an equilibrium price P_1 and equilibrium quantity Q_1. As a result of the bad weather, supply falls and S_1 shifts *leftward* to S_2. At the original price P_1, a shortage of cotton now exists and the market is no longer in equilibrium. The shortage causes a rise in price and a fall in quantity demanded, an upward movement along the demand curve. The new equilibrium is at E_2, with an equilibrium price P_2 and an equilibrium quantity Q_2. In the new equilibrium, E_2, the price is higher and the equilibrium quantity lower than before. This can be stated as a general principle: *When supply of a good or service decreases, the equilibrium price of the good or service rises and the equilibrium quantity of the good or service falls.*

What happens to the market when supply increases? An increase in supply leads to a *rightward* shift of the supply curve. At the original price, a surplus now exists; as a result, the equilibrium price falls and the quantity demanded rises. This describes what happened to the market for cotton as new technology increased cotton yields. We can formulate a general principle: *When supply of a good or service increases, the equilibrium price of the good or service falls and the equilibrium quantity of the good or service rises.*

Figure 7.5   Equilibrium and Shifts of the Supply Curve

The original equilibrium in the market for cotton is at E_1. Bad weather in cotton-growing areas causes a fall in the supply of cotton and shifts the supply curve leftward from S_1 to S_2. A new equilibrium is established at E_2, with a higher equilibrium price, P_2, and a lower equilibrium quantity, Q_2.
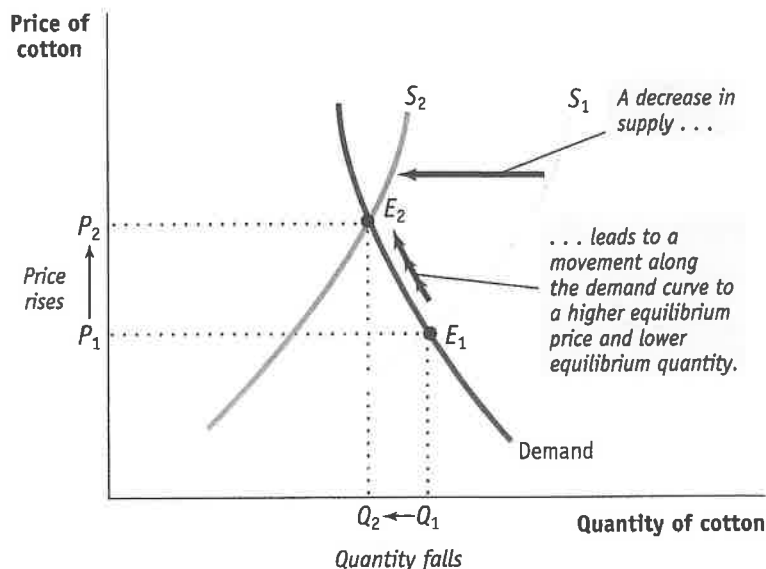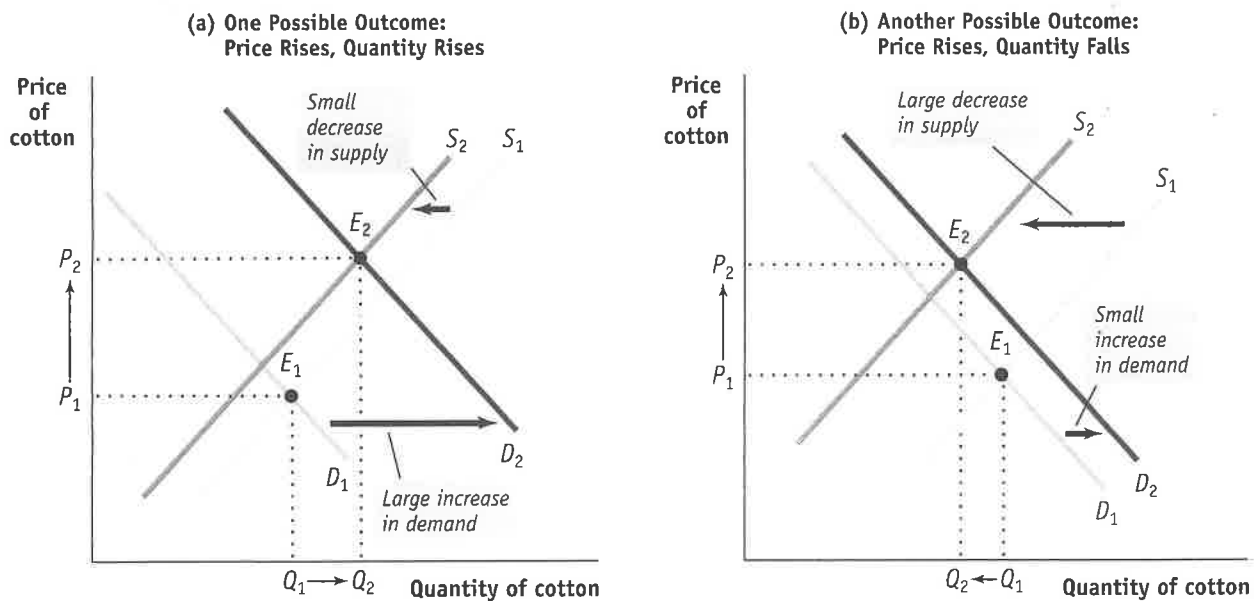
To summarize how a market responds to a change in supply: *An increase in supply leads to a fall in the equilibrium price and a rise in the equilibrium quantity. A decrease in supply leads to a rise in the equilibrium price and a fall in the equilibrium quantity.*

Simultaneous Shifts of Supply and Demand Curves

Finally, it sometimes happens that events shift *both* the demand and supply curves at the same time. This is not unusual; in real life, supply curves and demand curves for many goods and services shift quite often because the economic environment continually changes. **Figure 7.6** illustrates two examples of simultaneous shifts. In both panels there is an increase in demand—that is, a rightward shift of the demand curve, from D_1 to D_2—say, for example, representing an increase in the demand for cotton due to changing tastes. Notice that the rightward shift in panel (a) is larger than the one in panel (b): we can suppose that panel (a) represents a year in which many more people than usual choose to buy jeans and cotton T-shirts and panel (b) represents a normal year. Both panels also show a decrease in supply—that is, a leftward shift of the supply curve from S_1 to S_2. Also notice that the leftward shift in panel (b) is relatively larger than the one in panel (a): we can suppose that panel (b) represents the effect of particularly bad weather in Pakistan and panel (a) represents the effect of a much less severe weather event.

In both cases, the equilibrium price rises from P_1 to P_2, as the equilibrium moves from E_1 to E_2. But what happens to the equilibrium quantity, the quantity of cotton

Figure 7.6 Simultaneous Shifts of the Demand and Supply Curves

(a) One Possible Outcome: Price Rises, Quantity Rises

(b) Another Possible Outcome: Price Rises, Quantity Falls

In panel (a) there is a simultaneous rightward shift of the demand curve and leftward shift of the supply curve. Here the increase in demand is relatively larger than the decrease in supply, so the equilibrium price and equilibrium quantity both rise. In panel (b) there is also a simultaneous rightward shift of the demand curve and leftward shift of the supply curve. Here the decrease in supply is relatively larger than the increase in demand, so the equilibrium price rises and the equilibrium quantity falls.

bought and sold? In panel (a) the increase in demand is large relative to the decrease in supply, and the equilibrium quantity rises as a result. In panel (b), the decrease in supply is large relative to the increase in demand, and the equilibrium quantity falls as a result. That is, when demand increases and supply decreases, the actual quantity bought and sold can go either way, depending on *how much* the demand and supply curves have shifted.

In general, when supply and demand shift in opposite directions, we can't predict what the ultimate effect will be on the quantity bought and sold. What we can say is that a curve that shifts a disproportionately greater distance than the other curve will have a disproportionately greater effect on the quantity bought and sold. That said, we can make the following prediction about the outcome when the supply and demand curves shift in opposite directions:

- When demand increases and supply decreases, the equilibrium price rises but the change in the equilibrium quantity is ambiguous.
- When demand decreases and supply increases, the equilibrium price falls but the change in the equilibrium quantity is ambiguous.

But suppose that the demand and supply curves shift in the same direction. Before 2010, this was the case in the global market for cotton, where both supply and demand had increased over the past decade. Can we safely make any predictions about the changes in price and quantity? In this situation, the change in quantity bought and sold can be predicted, but the change in price is ambiguous. The two possible outcomes when the supply and demand curves shift in the same direction (which you should check for yourself) are as follows:

- When both demand and supply increase, the equilibrium quantity rises but the change in the equilibrium price is ambiguous.
- When both demand and supply decrease, the equilibrium quantity falls but the change in the equilibrium price is ambiguous.

FYI Makin' Bacon?

"Pork plight looming: Worldwide bacon shortage 'unavoidable' after drought, pig farmers warn." So read a recent headline in Canada's *National Post*. Behind the gloom and doom were droughts in 2012 that reduced the supply of corn. Why was the supply of bacon threatened? Because of what happens to the equilibrium price of corn, a key ingredient in a pig's dinner, when its supply decreases. High corn prices make it more expensive to raise the pigs whose bellies become bacon. This added expense reduced the supply of bacon. And with that, the price of bacon rose by

26 percent between mid-2012 and mid-2013.

Was there a shortage? No. There would have been a shortage if something prevented the price from rising to the equilibrium level. But as we have seen in our models, rising prices close the gap between the quantity supplied and the quantity demanded. Or, as explained by Andrew Dickson, general manager of the Manitoba Pork Council, "Is there less pork in the world? Probably, but I wouldn't call it a shortage. You give me the right price, and I will produce as much bacon as you want."

A decrease in the supply of bacon may cause consumers to squeal, but it won't cause a lasting shortage, because higher bacon prices will decrease the quantity demanded and increase the quantity supplied.

MODULE 7 Review

Check Your Understanding

1. In the following three situations, the market is initially in equilibrium. After each event described below, does a surplus or shortage exist at the original equilibrium price? What will happen to the equilibrium price as a result?
   a. In 2014 there was a bumper crop of wine grapes.
   b. After a hurricane, Florida hoteliers often find that many people cancel their upcoming vacations, leaving them with empty hotel rooms.
   c. After a heavy snowfall, many people want to buy second-hand snowblowers at the local tool shop.

2. For each of the following examples, explain how the indicated change affects supply or demand for the good in question and how the shift you describe affects the equilibrium price and quantity.
   a. As the price of gasoline fell in the United States during the 1990s, more people bought large cars.
   b. Technological innovation in the use of recycled paper has lowered the cost of paper production.

c. When a local cable company offers cheaper pay-per-view films, local movie theaters have more unfilled seats.

3. Periodically, a computer chip maker like Intel introduces a new chip that is faster than the previous one. In response, demand for computers using the earlier chip decreases as customers put off purchases in anticipation of machines containing the new chip. Simultaneously, computer makers increase their production of computers containing the earlier chip in order to clear out their stocks of those chips.

   Draw two diagrams of the market for computers containing the earlier chip: (a) one in which the equilibrium quantity falls in response to these events and (b) one in which the equilibrium quantity rises. What happens to the equilibrium price in each diagram?
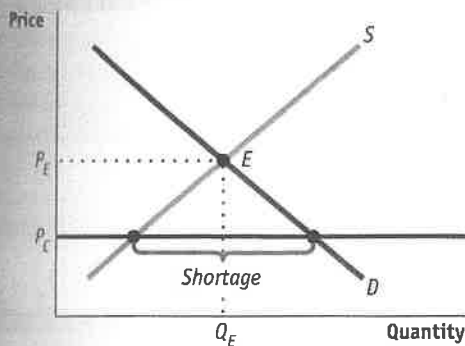
Tackle the Test: Multiple-Choice Questions

1. Which of the following describes what will happen in the market for tomatoes if a salmonella outbreak is attributed to tainted tomatoes?
   a. Supply will decrease and price will increase.
   b. Supply will decrease and price will decrease.
   c. Demand will decrease and price will increase.
   d. Demand will decrease and price will decrease.
   e. Supply and demand will both decrease.

2. Which of the following will lead to an increase in the equilibrium price of product "X"? A(n)
   a. increase in consumer incomes if product "X" is an inferior good
   b. increase in the price of machinery used to produce product "X"
   c. technological advance in the production of good "X"
   d. decrease in the price of good "Y" (a substitute for good "X")
   e. expectation by consumers that the price of good "X" is going to fall

3. The equilibrium price will rise, but the equilibrium quantity may increase, decrease, or stay the same if
   a. demand increases and supply decreases.
   b. demand increases and supply increases.

c. demand decreases and supply increases.
d. demand decreases and supply decreases.
e. demand increases and supply does not change.

4. An increase in the number of buyers and a technological advance will cause
   a. demand to increase and supply to increase.
   b. demand to increase and supply to decrease.
   c. demand to decrease and supply to increase.
   d. demand to decrease and supply to decrease.
   e. no change in demand and an increase in supply.

5. Which of the following is certainly true if demand and supply increase at the same time?
   a. The equilibrium price will increase.
   b. The equilibrium price will decrease.
   c. The equilibrium quantity will increase.
   d. The equilibrium quantity will decrease.
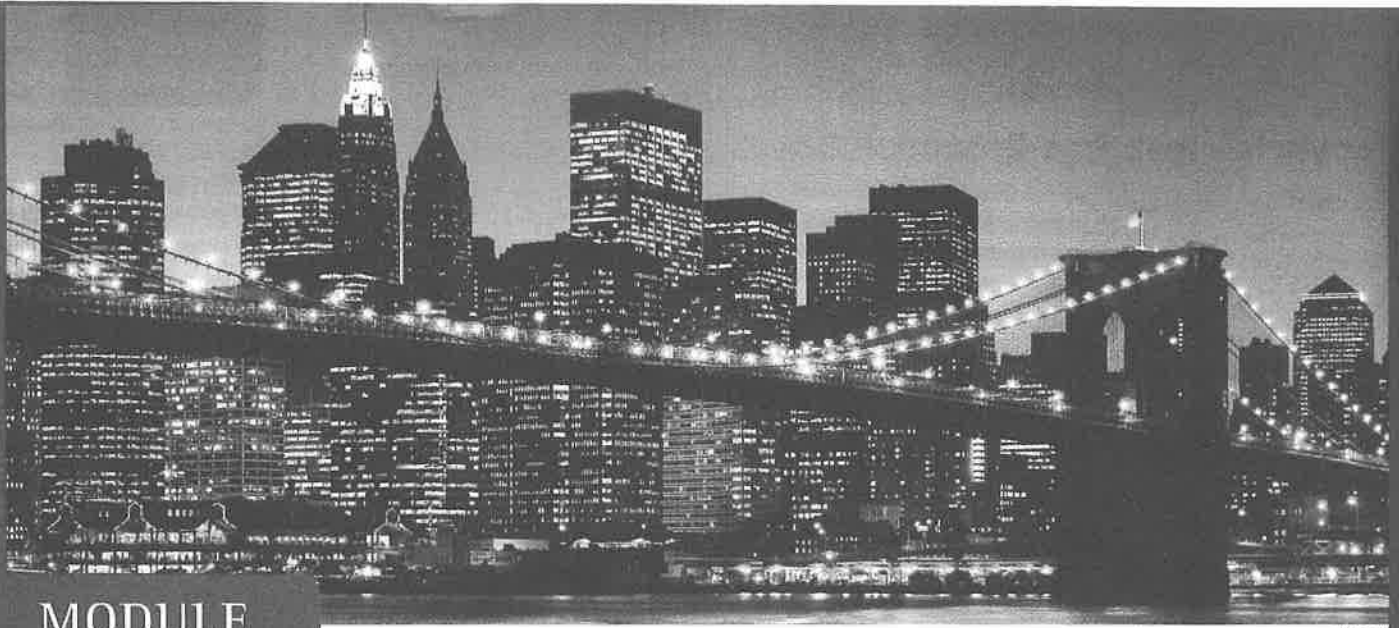   e. The equilibrium quantity may increase, decrease, or stay the same.

Tackle the Test: Free-Response Questions

1. Draw a correctly labeled graph showing the market for tomatoes in equilibrium. Label the equilibrium price "P_E" and the equilibrium quantity "Q_E." On your graph, draw a horizontal line indicating a price, labeled "P_C", that would lead to a shortage of tomatoes. Label the size of the shortage on your graph.

Rubric for FRQ 1 (6 points)

1 point: Graph with the vertical axis labeled "Price" or "P" and the horizontal axis labeled "Quantity" or "Q"

1 point: Downward-sloping demand curve labeled "Demand" or "D"

1 point: Upward-sloping supply curve labeled "Supply" or "S"

1 point: Equilibrium price "P_E" labeled on the vertical axis and quantity "Q_E" labeled on the horizontal axis at the intersection of the supply and demand curves

1 point: Price line at a price "P_C" below the equilibrium price

1 point: Correct indication of the shortage, which is the horizontal distance between the quantity demanded and the quantity supplied at the height of P_C

2. Draw a correctly labeled graph showing the market for cups of coffee in equilibrium. On your graph, show the effect of a decrease in the price of coffee beans on the equilibrium price and the equilibrium quantity in the market for cups of coffee.

(5 points)

Supply and Demand: Price Controls (Ceilings and Floors)

In this Module, you will learn to:

- Explain the workings of price controls, one way government intervenes in markets
- Describe how price controls can create problems and make a market inefficient
- Explain why economists are often deeply skeptical of attempts to intervene in markets
- Identify who benefits and who loses from price controls

Why Governments Control Prices

In Module 7, you learned that a market moves to equilibrium—that is, the market price moves to the level at which the quantity supplied equals the quantity demanded. But this equilibrium price does not necessarily please either buyers or sellers.

After all, buyers would always like to pay less if they could, and sometimes they can make a strong moral or political case that they should pay lower prices. For example, what if the equilibrium between supply and demand for apartments in a major city leads to rental rates that an average working person can't afford? In that case, a government might well be under pressure to impose limits on the rents landlords can charge.

Sellers, however, would always like to get more money for what they sell, and sometimes they can make a strong moral or political case that they should receive higher prices. For example, consider the labor market: the price for an hour of a worker's time is the wage rate. What if the equilibrium between supply and demand for less skilled workers leads to wage rates that yield an income below the poverty level? In that case, a government might well be pressured to require employers to pay a rate no lower than some specified minimum wage.

> **Price controls** are legal restrictions on how high or low a market price may go. They can take two forms: a **price ceiling**, a maximum price sellers are allowed to charge for a good or service, or a **price floor**, a minimum price buyers are required to pay for a good or service.

In other words, there is often a strong political demand for governments to intervene in markets. And powerful interests can make a compelling case that a market intervention favoring them is "fair." When a government intervenes to regulate prices, we say that it imposes **price controls**. These controls typically take the form of either an upper limit, a **price ceiling**, or a lower limit, a **price floor**.

Unfortunately, it's not that easy to tell a market what to do. As we will now see, when a government tries to legislate prices—whether it legislates them *down* by imposing a

price ceiling or *up* by imposing a price floor—there are certain predictable and unpleasant side effects.

We make an important assumption in this module: the markets in question are efficient before price controls are imposed. Markets can sometimes be inefficient—for example, a market dominated by a monopolist, a single seller who has the power to influence the market price. When markets are inefficient, price controls don't necessarily cause problems and can potentially move the market closer to efficiency. In practice, however, price controls often *are* imposed on efficient markets—like the New York City apartment market. And so the analysis in this module applies to many important real-world situations.

Price Ceilings

Aside from rent control, there are not many price ceilings in the United States today. But at times they have been widespread. Price ceilings are typically imposed during crises— wars, harvest failures, natural disasters—because these events often lead to sudden price increases that hurt many people but produce big gains for a lucky few. The U.S. government imposed ceilings on many prices during World War II: the war sharply increased demand for raw materials, such as aluminum and steel, and price controls prevented those with access to these raw materials from earning huge profits. Price controls on oil were imposed in 1973, when an embargo by Arab oil-exporting countries seemed likely to generate huge profits for U.S. oil companies. Price controls were imposed on California's wholesale electricity market in 2001, when a shortage created big profits for a few power-generating companies but led to higher electricity bills for consumers.

Believe it or not, rent control in New York is a legacy of World War II: it was imposed because wartime production created an economic boom, which increased demand for apartments at a time when the labor and raw materials that might have been used to build them were being used to win the war instead. Although most price controls were removed soon after the war ended, New York's rent limits were retained and gradually extended to buildings not previously covered, leading to some very strange situations.

You can rent a one-bedroom apartment in Manhattan on fairly short notice—if you are able and willing to pay several thousand dollars a month and live in a less-than-desirable area. Yet some people pay only a small fraction of this amount for comparable apartments, and others pay hardly more for bigger apartments in better locations.

Aside from producing great deals for some renters, however, what are the broader consequences of New York's rent control system? To answer this question, we turn to the supply and demand model.

Modeling a Price Ceiling

To see what can go wrong when a government imposes a price ceiling on an efficient market, consider **Figure 8.1** on the next page, which shows a simplified model of the market for apartments in New York. For the sake of simplicity, we imagine that all apartments are exactly the same and so would rent for the same price in an unregulated market. The table in the figure shows the demand and supply schedules; the demand and supply curves are shown on the left. We show the quantity of apartments on the horizontal axis and the monthly rent per apartment on the vertical axis. You can see that in an unregulated market the equilibrium would be at point *E:* 2 million apartments would be rented for $1,000 each per month.

Now suppose that the government imposes a price ceiling, limiting rents to a price below the equilibrium price—say, no more than $800. **Figure 8.2** on the next page shows the effect of the price ceiling, represented by the line at $800. At the enforced rental rate of $800, landlords have less incentive to offer apartments, so they won't be willing to supply as many as they would at the equilibrium rate of $1,000. They will choose point *A* on the supply curve, offering only 1.8 million apartments for rent, 200,000 fewer than in the unregulated market. At the same time, more people will want to rent apartments at a price of $800 than at the equilibrium price of $1,000; as shown at point *B* on the demand curve,

Figure 8.1 The Market for Apartments in the Absence of Government Controls
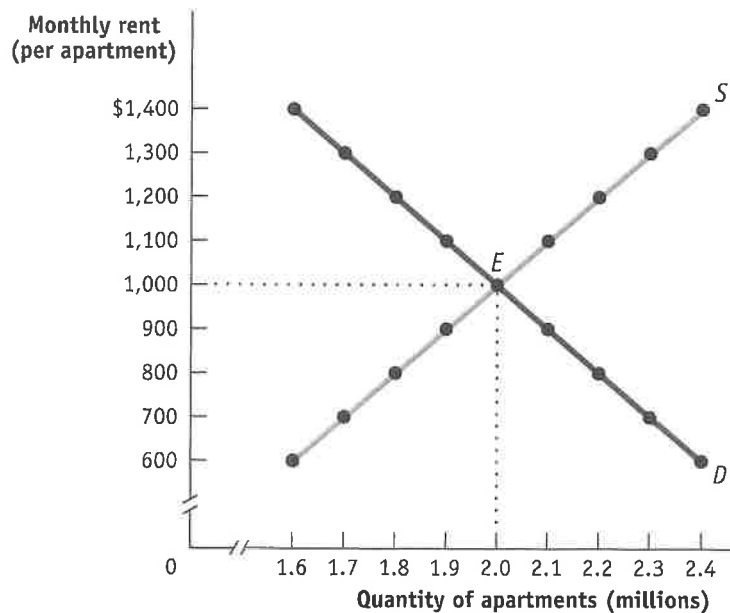

Monthly rent (per apartment)	Quantity of apartments (millions)	
	Quantity demanded	Quantity supplied
$1,400	1.6	2.4
1,300	1.7	2.3
1,200	1.8	2.2
1,100	1.9	2.1
1,000	2.0	2.0
900	2.1	1.9
800	2.2	1.8
700	2.3	1.7
600	2.4	1.6

Without government intervention, the market for apartments reaches equilibrium at point E with a market rent of $1,000 per month and 2 million apartments rented.

Figure 8.2 The Effects of a Price Ceiling

The black horizontal line represents the government-imposed price ceiling on rents of $800 per month. This price ceiling reduces the quantity of apartments supplied to 1.8 million, point A, and increases the quantity demanded to 2.2 million, point B. This creates a persistent shortage of 400,000 units: 400,000 of the people who want apartments at the legal rent of $800 cannot get them.
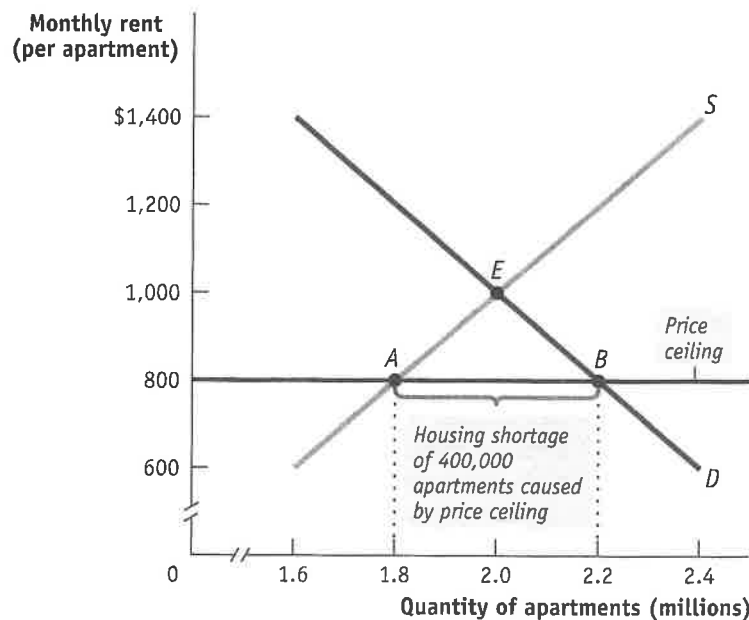
at a monthly rent of $800 the quantity of apartments demanded rises to 2.2 million, 200,000 more than in the unregulated market and 400,000 more than are actually available at the price of $800. So there is now a persistent shortage of rental housing: at that price, there are 400,000 more people who want to rent than are able to find apartments.

Do price ceilings always cause shortages? No. If a price ceiling is set above the equilibrium price, it won't have any effect. Suppose that the equilibrium rental rate on apartments is $1,000 per month and the city government sets a ceiling of $1,200. Who cares? In this case, the price ceiling won't be binding—it won't actually constrain market behavior—and it will have no effect.

Inefficient Allocation to Consumers Rent control doesn't just lead to too few apartments being available. It can also lead to misallocation of the apartments that are available: people who badly need a place to live may not be able to find an apartment, while some apartments may be occupied by people with much less urgent needs.

In the case shown in Figure 8.2, 2.2 million people would like to rent an apartment at $800 per month, but only 1.8 million apartments are available. Of those 2.2 million who are seeking an apartment, some want an apartment badly and are willing to pay a high price to get one. Others have a less urgent need and are only willing to pay a low price, perhaps because they have alternative housing. An efficient allocation of apartments would reflect these differences: people who really want an apartment will get one and people who aren't all that eager to find an apartment won't. In an inefficient distribution of apartments, the opposite will happen: some people who are not especially eager to find an apartment will get one and others who are very eager to find an apartment won't. Because people usually get apartments through luck or personal connections under rent control, it generally results in an **inefficient allocation to consumers** of the few apartments available.

To see the inefficiency involved, consider the plight of the Lees, a family with young children who have no alternative housing and would be willing to pay up to $1,500 for an apartment—but are unable to find one. Also consider George, a retiree who lives most of the year in Florida but still has a lease on the New York apartment he moved into 40 years ago. George pays $800 per month for this apartment, but if the rent were even slightly more—say, $850—he would give it up and stay with his children when he is in New York.

This allocation of apartments—George has one and the Lees do not—is a missed opportunity: there is a way to make the Lees and George both better off at no additional cost. The Lees would be happy to pay George, say, $1,200 a month to sublease his apartment, which he would happily accept since the apartment is worth no more than $849 a month to him. George would prefer the money he gets from the Lees to keeping his apartment; the Lees would prefer to have the apartment rather than the money. So both would be made better off by this transaction—and nobody else would be made worse off.

Generally, if people who really want apartments could sublease them from people who are less eager to live there, both those who gain apartments and those who trade their occupancy for money would be better off. However, subletting is illegal under rent control because it would occur at prices above the price ceiling. The fact that subletting is illegal doesn't mean it never happens. In fact, chasing down illegal subletting is a major business for New York private investigators. A 2007 report in the *New York Times* described how private investigators use hidden cameras and other tricks to prove that the legal tenants in rent-controlled apartments actually live in the suburbs, or even in other states, and have sublet their apartments at two or three times the controlled rent. This subletting is a kind of illegal activity, which we will discuss shortly. For now, just notice that the aggressive pursuit of illegal subletting surely discourages the practice, so there isn't enough subletting to eliminate the inefficient allocation of apartments.

Wasted Resources Another reason a price ceiling causes inefficiency is that it leads to wasted resources: people expend money, effort, and time to cope with the shortages caused by the price ceiling. Back in 1979, U.S. price controls on gasoline led to shortages that forced millions of Americans to spend hours each week waiting in lines at gas stations. The opportunity cost of the time spent in gas lines—the wages not earned, the leisure time not enjoyed—constituted wasted resources from the point of

Price ceilings often lead to inefficiency in the form of **inefficient allocation to consumers**: people who want the good badly and are willing to pay a high price don't get it, and those who care relatively little about the good and are only willing to pay a relatively low price do get it.

Price ceilings typically lead to inefficiency in the form of **wasted resources**: people expend money, effort, and time to cope with the shortages caused by the price ceiling.

view of consumers and of the economy as a whole. Because of rent control, the Lees will spend all their spare time for several months searching for an apartment, time they would rather have spent working or engaged in family activities. That is, there is an opportunity cost to the Lees' prolonged search for an apartment—the leisure or income they had to forgo. If the market for apartments worked freely, the Lees would quickly find an apartment at the equilibrium rent of $1,000, leaving them time to earn more or to enjoy themselves—an outcome that would make them better off without making anyone else worse off. Again, rent control creates missed opportunities.

Inefficiently Low Quality Yet another way a price ceiling causes inefficiency is by causing goods to be of inefficiently low quality. **Inefficiently low quality** means that sellers offer low-quality goods at a low price even though buyers would rather have higher quality and are willing to pay a higher price for it.

Again, consider rent control. Landlords have no incentive to provide better conditions because they cannot raise rents to cover their repair costs but are able to find tenants easily. In many cases, tenants would be willing to pay much more for improved conditions than it would cost for the landlord to provide them—for example, the upgrade of an anti-quated electrical system that cannot safely run air conditioners or computers. But any additional payment for such improvements would be legally considered a rent increase, which is prohibited. Indeed, rent-controlled apartments are notoriously badly main-tained, rarely painted, subject to frequent electrical and plumbing problems, sometimes even hazardous to inhabit. As one former manager of Manhattan buildings explained, "At unregulated apartments we'd do most things that the tenants requested. But on the rent-regulated units, we did absolutely only what the law required. . . . We had a perverse incentive to make those tenants unhappy. With regulated apartments, the ultimate objec-tive is to get people out of the building [because rents can be raised for new tenants]."

This whole situation is a missed opportunity—some tenants would be happy to pay for better conditions, and landlords would be happy to provide them for payment. But such an exchange would occur only if the market were allowed to operate freely.

Black Markets And that leads us to a last aspect of price ceilings: the incentive they provide for illegal activities, specifically the emergence of **black markets**. We have already described one kind of black market activity—illegal subletting by tenants. But it does not stop there. Clearly, there is a temptation for a landlord to say to a potential tenant, "Look, you can have the place if you slip me an extra few hundred in cash each month"—and for the tenant to agree, if he or she is one of those people who would be willing to pay much more than the maximum legal rent.

What's wrong with black markets? In general, it's a bad thing if people break *any* law because it encourages disrespect for the law in general. Worse yet, in this case illegal activity worsens the position of those who try to be honest. If the Lees are scrupulous about upholding the rent control law but other people—who may need an apartment less than the Lees—are willing to bribe landlords, the Lees may *never* find an apartment.

So Why Are There Price Ceilings?

We have seen three common results of price ceilings:

- a persistent shortage of the good
- inefficiency arising from this persistent shortage in the form of inefficiently low quantity, inefficient allocation of the good to consumers, resources wasted in searching for the good, and the inefficiently low quality of the good offered for sale
- the emergence of illegal, black market activity

Given these unpleasant consequences, why do governments still sometimes impose price ceilings? Why does rent control, in particular, persist in New York?

One answer is that although price ceilings may have adverse effects, they do benefit some people. In practice, New York's rent control rules—which are more complex than our simple model—hurt most residents but give a small minority of renters much cheaper

Signs advertising apartments to rent or sublet are common in New York City.

Price ceilings often lead to inefficiency in that the goods being offered are of **inefficiently low quality**: sellers offer low quality goods at a low price even though buyers would prefer a higher quality at a higher price.

A **black market** is a market in which goods or services are bought and sold illegally—either because it is illegal to sell them at all or because the prices charged are legally prohibited by a price ceiling.

housing than they would get in an unregulated market. And those who benefit from the controls may be better organized and more vocal than those who are harmed by them.

Also, when price ceilings have been in effect for a long time, buyers may not have a realistic idea of what would happen without the price ceilings. In our previous example, the rental rate in an unregulated market (Figure 8.1) would be only 25% higher than in the regulated market (Figure 8.2): $1,000 instead of $800. But how would renters know that? Indeed, they might have heard about black market transactions at much higher prices—the Lees or some other family paying George $1,200 or more—and would not realize that these black market prices are much higher than the price that would prevail in a fully unregulated market.

A last answer is that government officials often do not understand supply and demand analysis! It is a great mistake to suppose that economic policies in the real world are always sensible or well informed.

Price Floors

Sometimes governments intervene to push market prices up instead of down. *Price floors* have been widely legislated for agricultural products, such as wheat and milk, as a way to support the incomes of farmers. Historically, there were also price floors on such services as trucking and air travel, although these were phased out by the U.S. government in the 1970s. If you have ever worked in a fast-food restaurant, you are likely to have encountered a price floor: governments in the United States and many other countries maintain a lower limit on the hourly wage rate paid for a worker's labor—that is, a floor on the price of labor—called the **minimum wage**.
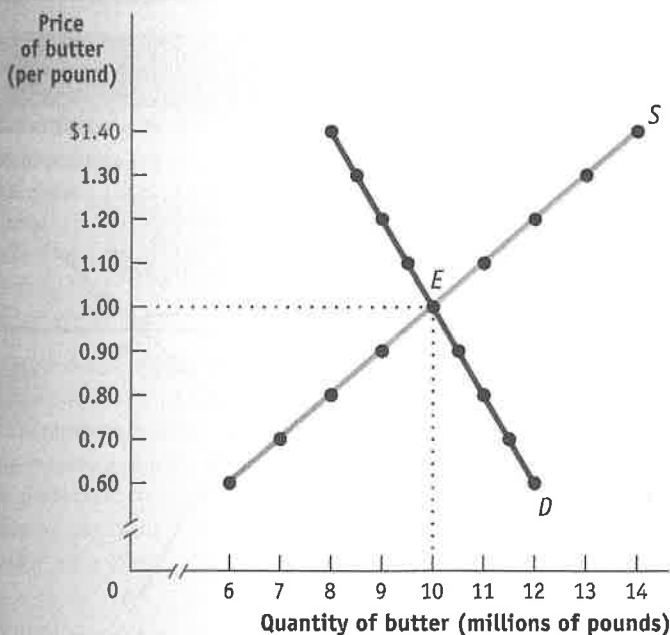
Just like price ceilings, price floors are intended to help some people but generate predictable and undesirable side effects. **Figure 8.3** shows hypothetical supply and demand

The **minimum wage** is a legal floor on the hourly wage rate paid for a worker's labor.

Figure 8.3 The Market for Butter in the Absence of Government Controls

Price of butter (per pound)	Quantity of butter (millions of pounds)	
	Quantity demanded	Quantity supplied
$1.40	8.0	14.0
1.30	8.5	13.0
1.20	9.0	12.0
1.10	9.5	11.0
1.00	10.0	10.0
0.90	10.5	9.0
0.80	11.0	8.0
0.70	11.5	7.0
0.60	12.0	6.0

Without government intervention, the market for butter reaches equilibrium at a price of $1 per pound with 10 million pounds of butter bought and sold.

curves for butter. Left to itself, the market would move to equilibrium at point *E*, with 10 million pounds of butter bought and sold at a price of $1 per pound.

Now suppose that the government, in order to help dairy farmers, imposes a price floor on butter of $1.20 per pound. Its effects are shown in **Figure 8.4**, where the line at $1.20 represents the price floor. At a price of $1.20 per pound, producers would want to supply 12 million pounds (point *B* on the supply curve) but consumers would want to buy only 9 million pounds (point *A* on the demand curve). So the price floor leads to a persistent surplus of 3 million pounds of butter.

Does a price floor always lead to an unwanted surplus? No. Just as in the case of a price ceiling, the floor may not be binding—that is, it may be irrelevant. If the equilibrium price of butter is $1 per pound but the floor is set at only $0.80, the floor has no effect.

But suppose that a price floor *is* binding: what happens to the unwanted surplus? The answer depends on government policy. In the case of agricultural price floors, governments buy up unwanted surplus. As a result, the U.S. government has at times found itself warehousing thousands of tons of butter, cheese, and other farm products. (The European Commission, which administers price floors for a number of European countries, once found itself the owner of a so-called butter mountain, equal in weight to the entire population of Austria.) The government then has to find a way to dispose of these unwanted goods.

Some countries pay exporters to sell products at a loss overseas; this is standard procedure for the European Union. The United States gives surplus food away to schools, which use the products in school lunches. In some cases, governments have actually destroyed the surplus production. To avoid the problem of dealing with the unwanted surplus, the U.S. government typically pays farmers not to produce the products at all.

When the government is not prepared to purchase the unwanted surplus, a price floor means that would-be sellers cannot find buyers. This is what happens when there is a price floor on the wage rate paid for an hour of labor, the *minimum wage:* when the minimum wage is above the equilibrium wage rate, some people who are willing to work—that is, sell labor—cannot find buyers—that is, employers—willing to give them jobs.

Figure 8.4   The Effects of a Price Floor

The dark horizontal line represents the government-imposed price floor of $1.20 per pound of butter. The quantity of butter demanded falls to 9 million pounds, and the quantity supplied rises to 12 million pounds, generating a persistent surplus of 3 million pounds of butter.
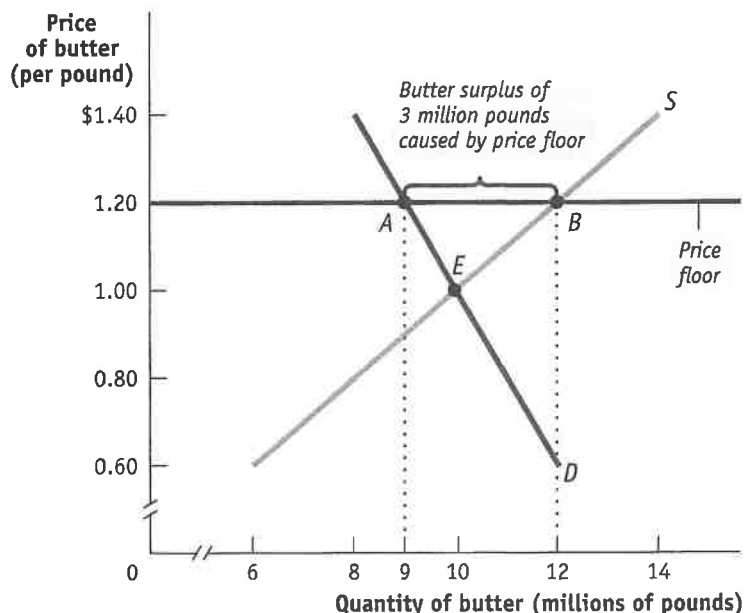
FYI — Price Floors and School Lunches

When you were in grade school, did your school offer free or very cheap lunches? If so, you were probably a beneficiary of price floors.

Where did all the cheap food come from? During the 1930s, when the U.S. economy was going through the Great Depression, a prolonged economic slump, prices were low and farmers were suffering severely. In an effort to help rural Americans, the U.S. government imposed price floors on a number of agricultural products. The system of agricultural price floors—officially called price support programs—continues to this day. Among the products subject to price support are sugar and various dairy products; at times grains, beef, and pork have also had a minimum price.

The big problem with any attempt to impose a price floor is that it creates a surplus. To some extent the U.S. Department of Agriculture has tried

to head off surpluses by taking steps to reduce supply; for example, by paying farmers *not* to grow crops. As a last resort, however, the U.S. government has been willing to buy up the surplus, taking the excess supply off the market.

But then what? The government has to find a way to get rid of the agricultural products it has bought. It can't just sell them: that would depress market prices, forcing the government to buy the stuff right back. So it has to give it away in ways that don't depress market prices. One of the ways it does this is by giving surplus food, free, to school lunch programs. These gifts are known as "bonus foods." Along with financial aid, bonus foods are what allow many school districts to provide free or very cheap lunches to their students. Is this a story with a happy ending?

Not really. Nutritionists, concerned about growing child obesity in the

United States, place part of the blame on those bonus foods. Schools get whatever the government has too much of—and that has tended to include a lot of dairy products, beef, and corn, and not much in the way of fresh vegetables or fruit. As a result, school lunches that make extensive use of bonus foods tend to be very high in fat and calories. So this is a case in which there is such a thing as a free lunch—but this lunch may be bad for your health.

How a Price Floor Causes Inefficiency

The persistent surplus that results from a price floor creates missed opportunities—inefficiencies—that resemble those created by the shortage that results from a price ceiling.

Inefficiently Low Quantity Because a price floor raises the price of a good to consumers, it reduces the quantity of that good demanded; because sellers can't sell more units of a good than buyers are willing to buy, a price floor reduces the quantity of a good bought and sold below the market equilibrium quantity. Notice that this is the *same* effect as a price ceiling. You might be tempted to think that a price floor and a price ceiling have opposite effects, but both have the effect of reducing the quantity of a good bought and sold.

Inefficient Allocation of Sales Among Sellers Like a price ceiling, a price floor can lead to *inefficient allocation*—but in this case **inefficient allocation of sales among sellers** rather than inefficient allocation to consumers.

Suppose you would be willing to sell your English tutoring services for $5 per hour, but the minimum wage is $9 per hour. The job might go to someone else who would tutor for $9 per hour but not for less. In this case, the price floor on wages prevents the worker who would sell tutoring services for the lowest amount from being able to do so.

Wasted Resources Also like a price ceiling, a price floor generates inefficiency by *wasting resources*. The most graphic examples involve government purchases of the unwanted surpluses of agricultural products caused by price floors. When the surplus production is simply destroyed, and when the stored produce goes, as officials euphemistically put it, "out of condition" and must be thrown away, it is pure waste.

Price floors lead to **inefficient allocation of sales among sellers**: those who would be willing to sell the good at the lowest price are not always those who manage to sell it.

Price floors also lead to wasted time and effort. Consider the minimum wage. Would-be workers who spend many hours searching for jobs, or waiting in line in the hope of getting jobs, play the same role in the case of price floors as hapless families searching for apartments in the case of price ceilings.

Inefficiently High Quality Again like price ceilings, price floors lead to inefficiency in the quality of goods produced.

We've seen that when there is a price ceiling, suppliers produce goods that are of inefficiently low quality: buyers prefer higher-quality products and are willing to pay for them, but sellers refuse to improve the quality of their products because the price ceiling prevents their being compensated for doing so. This same logic applies to price floors, but in reverse: suppliers offer goods of **inefficiently high quality**.

How can this be? Isn't high quality a good thing? Yes, but only if it is worth the cost. Suppose that suppliers spend a lot to make goods of very high quality but that this quality isn't worth much to consumers, who would rather receive the money spent on that quality in the form of a lower price. This represents a missed opportunity: suppliers and buyers could make a mutually beneficial deal in which buyers got goods of lower quality for a much lower price.

A good example of the inefficiency of excessive quality comes from the days when transatlantic airfares were set artificially high by international treaty. Forbidden to compete for customers by offering lower ticket prices, airlines instead offered expensive services, like lavish in-flight meals that went largely uneaten. At one point the regulators tried to restrict this practice by defining maximum service standards—for example, that snack service should consist of no more than a sandwich. One airline then introduced what it called a "Scandinavian Sandwich," a towering affair that forced the convening of another conference to define *sandwich*. All of this was wasteful, especially considering that what passengers really wanted was less food and lower airfares.

Since the deregulation of U.S. airlines in the 1970s, American passengers have experienced a large decrease in ticket prices accompanied by a decrease in the quality of in-flight service—smaller seats, lower-quality food, and so on. Everyone complains about the service—but thanks to lower fares, the number of people flying on U.S. carriers has grown several hundred percent since airline deregulation.

Illegal Activity Finally, like price ceilings, price floors provide incentives for illegal activity. For example, in countries where the minimum wage is far above the equilibrium wage rate, workers desperate for jobs sometimes agree to work off the books for employers who conceal their employment from the government—or bribe the government inspectors. This practice, known in Europe as "black labor," is especially common in southern European countries such as Italy and Spain.

So Why Are There Price Floors?

To sum up, a price floor creates various negative side effects:

- a persistent surplus of the good

- inefficiency arising from the persistent surplus in the form of inefficiently low quantity, inefficient allocation of sales among sellers, wasted resources, and an inefficiently high level of quality offered by suppliers

- the temptation to engage in illegal activity, particularly bribery and corruption of government officials

So why do governments impose price floors when they have so many negative side effects? The reasons are similar to those for imposing price ceilings. Government officials often disregard warnings about the consequences of price floors either because they believe that the relevant market is poorly described by the supply and demand model or, more often, because they do not understand the model. Above all, just as price ceilings are often imposed because they benefit some influential buyers of a good, price floors are often imposed because they benefit some influential sellers.

Price floors often lead to inefficiency in that goods of **inefficiently high quality** are offered: sellers offer high-quality goods at a high price, even though buyers would prefer a lower quality at a lower price.

istockphoto

Check Your Understanding

1. On game days, homeowners near Middletown University's stadium used to rent parking spaces in their driveways to fans at a going rate of $11. A new town ordinance now sets a maximum parking fee of $7. Use the accompanying supply and demand diagram to show how each of the following can result from the price ceiling.
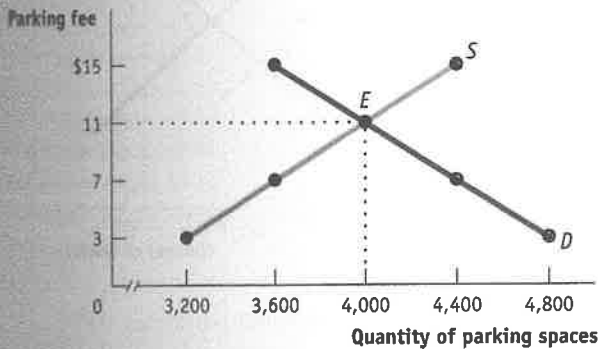
a. Some homeowners now think it's not worth the hassle to rent out spaces.
b. Some fans who used to carpool to the game now drive alone.
c. Some fans can't find parking and leave without seeing the game.
Explain how each of the following adverse effects arises from the price ceiling.
d. Some fans now arrive several hours early to find parking.
e. Friends of homeowners near the stadium regularly attend games, even if they aren't big fans. But some serious fans have given up because of the parking situation.
f. Some homeowners rent spaces for more than $7 but pretend that the buyers are nonpaying friends or family.

2. True or false? Explain your answer. A price ceiling below the equilibrium price in an otherwise efficient market does the following:
a. increases quantity supplied
b. makes some people who want to consume the good worse off
c. makes all producers worse off

3. The state legislature mandates a price floor for gasoline of P_F per gallon. Assess the following statements and illustrate your answer using the figure provided.
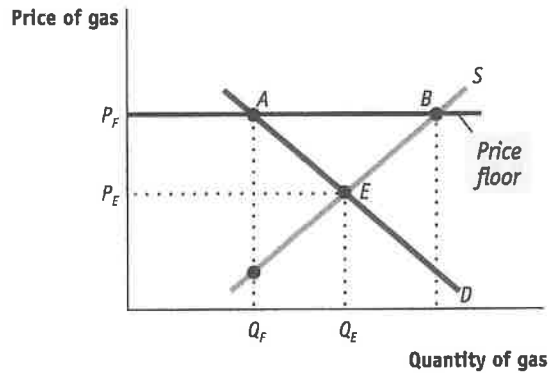

a. Proponents of the law claim it will increase the income of gas station owners. Opponents claim it will hurt gas station owners because they will lose customers.
b. Proponents claim consumers will be better off because gas stations will provide better service. Opponents claim consumers will be generally worse off because they prefer to buy gas at cheaper prices.
c. Proponents claim that they are helping gas station owners without hurting anyone else. Opponents claim that consumers are hurt and will end up doing things like buying gas in a nearby state or on the black market.

Tackle the Test: Multiple-Choice Questions

1. To be effective, a price ceiling must be set
    I. above the equilibrium price.
    II. in the housing market.
    III. to achieve the equilibrium market quantity.
   a. I
   b. II
   c. III
   d. I, II, and III
   e. None of the above

2. Refer to the graph provided. A price floor set at $5 will result in

Price

Quantity
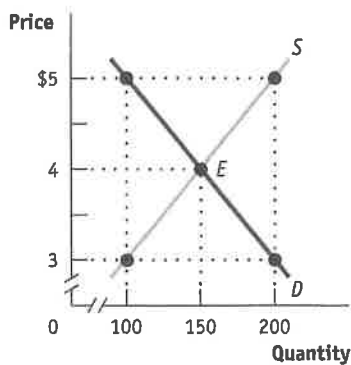
   a. a shortage of 100 units.
   b. a surplus of 100 units.
   c. a shortage of 200 units.
   d. a surplus of 200 units.
   e. a surplus of 50 units.

3. Effective price ceilings are inefficient because they
   a. create shortages.
   b. lead to wasted resources.
   c. decrease quality.
   d. create black markets.
   e. do all of the above.

4. Refer to the graph provided. If the government establishes a minimum wage at $10, how many workers will benefit from the higher wage?

Wage (per hour)

Number of workers
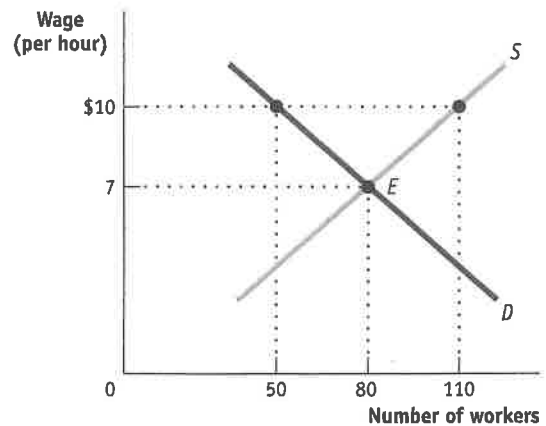
   a. 30
   b. 50
   c. 60
   d. 80
   e. 110

5. Refer to the graph for Question 4. With a minimum wage of $10, how many workers are unemployed (would like to work, but are unable to find a job)?
   a. 30
   b. 50
   c. 60
   d. 80
   e. 110

Tackle the Test: Free-Response Questions

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b)?

1. Refer to the graph provided to answer the following questions.
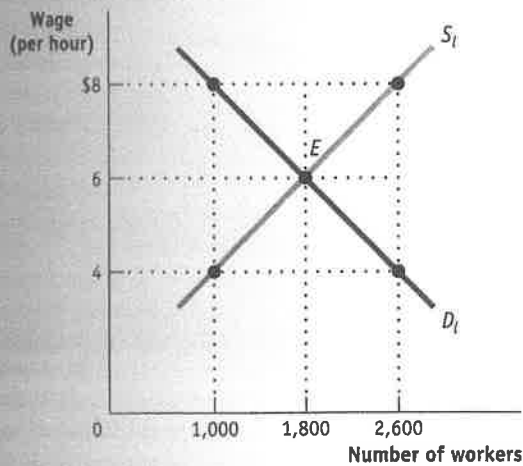
a. What are the equilibrium wage and quantity of workers in this market?

b. For it to have an effect, where would the government have to set a minimum wage?

c. If the government set a minimum wage at $8,

   i. how many workers would supply their labor?

   ii. how many workers would be hired?

   iii. how many workers would want to work that did *not* want to work for the equilibrium wage?

   iv. how many previously employed workers would no longer have a job?

Rubric for FRQ 1 (6 points)

1 point: equilibrium wage = $6, quantity of labor = 1,800

1 point: The minimum wage will have an effect if it is set anywhere above $6.

1 point: 2,600 workers would supply their labor

1 point: 1,000 workers would be hired

1 point: 800 (the number of workers who would want to work for $8 but did not supply labor for $6)

1 point: 800 (at the equilibrium wage of $6, 1,800 workers were hired; at a wage of $8, 1,000 workers would be hired. 1,800 − 1,000 = 800)

2. Draw a correctly labeled graph of a housing market in equilibrium. On your graph, illustrate an effective legal limit (ceiling) on rent. Identify the quantity of housing demanded, the quantity of housing supplied, and the size of the resulting surplus or shortage.

(6 points)

Supply and Demand: Quantity Controls

In this Module, you will learn to:

- Explain the workings of quantity controls, another way government intervenes in markets
- Describe how quantity controls create problems and can make a market inefficient
- Explain who benefits and who loses from quantity controls

Controlling Quantities

In the 1930s, New York City instituted a system of licensing for taxicabs: only taxis with a "medallion" were allowed to pick up passengers. Because this system was intended to ensure quality, medallion owners were supposed to maintain certain standards, including safety and cleanliness. A total of 11,787 medallions were issued, with taxi owners paying $10 for each medallion.

In 1995, there were still only 11,787 licensed taxicabs in New York, even though the city had meanwhile become the financial capital of the world, a place where hundreds of thousands of people in a hurry tried to hail a cab every day. (An additional 400 medallions were issued in 1995; after several rounds of sales of additional medallions, today there are 13,257 medallions.) The result of this restriction on the number of taxis was that a New York City taxi medallion became very valuable: if you wanted to operate a taxi in New York, you had to lease a medallion from someone else or buy one for a going price of several hundred thousand dollars.

It turns out that this story is not unique; other cities introduced similar medallion systems in the 1930s and, like New York, have issued few new medallions since. In San Francisco and Boston, as in New York, taxi medallions trade for six-figure prices.

A taxi medallion system is a form of **quantity control**, or **quota**, by which the government regulates the quantity of a good that can be bought and sold rather than regulating the price. Typically, the government limits quantity in a market by issuing **licenses**; only people with a license can legally supply the good. A taxi medallion is just such a license. The government of New York City limits the number of taxi rides that can be sold by limiting the number of taxis to only those who hold medallions. There are many other cases of quantity controls, ranging from limits on how much foreign currency (for instance, British pounds or Mexican pesos) people are allowed to buy to the quantity of clams New Jersey fishing boats are allowed to catch. Section 8 discusses quotas on goods imported from other countries.

A **quantity control**, or **quota**, is an upper limit on the quantity of some good that can be bought or sold.

A **license** gives its owner the right to supply a good or service.

Some attempts to control quantities are undertaken for good economic reasons, some for bad ones. In many cases, as we will see, quantity controls introduced to address a temporary problem become politically hard to remove later because the beneficiaries don't want them abolished, even after the original reason for their existence is long gone. But whatever the reasons for such controls, they have certain predictable—and usually undesirable—economic consequences.

The Anatomy of Quantity Controls

To understand why a New York taxi medallion is worth so much money, we consider a simplified version of the market for taxi rides, shown in **Figure 9.1**. Just as we assumed in the analysis of rent control that all apartments were the same, we now suppose that all taxi rides are the same—ignoring the real-world complication that some taxi rides are longer, and therefore more expensive, than others. The table in the figure shows supply and demand schedules. The equilibrium—indicated by point E in the figure and by the shaded entries in the table—is a fare of $5 per ride, with 10 million rides taken per year. (You'll see in a minute why we present the equilibrium this way.)

The New York medallion system limits the number of taxis, but each taxi driver can offer as many rides as he or she can manage. (Now you know why New York taxi drivers are so aggressive!) To simplify our analysis, however, we will assume that a medallion system limits the number of taxi rides that can legally be given to 8 million per year.
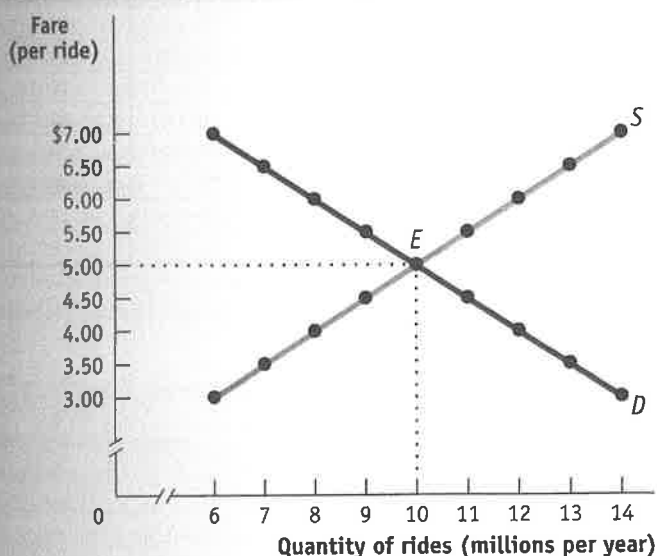
Until now, we have derived the demand curve by answering questions of the form: "How many taxi rides will passengers want to take if the price is $5 per ride?" But it is possible to reverse the question and ask instead: "At what price will consumers want to buy 10 million rides per year?" The price at which consumers want to buy a given quantity—in this case, 10 million rides at $5 per ride—is the **demand price** of that quantity. You can see from the demand schedule in Figure 9.1 that the demand price of 6 million rides is $7 per ride, the demand price of 7 million rides is $6.50 per ride, and so on.

The **demand price** of a given quantity is the price at which consumers will demand that quantity.

Figure 9.1 The Market for Taxi Rides in the Absence of Government Controls

Fare (per ride)	Quantity of rides (millions per year)	
	Quantity demanded	Quantity supplied
$7.00	6	14
6.50	7	13
6.00	8	12
5.50	9	11
5.00	10	10
4.50	11	9
4.00	12	8
3.50	13	7
3.00	14	6

Without government intervention, the market reaches equilibrium with 10 million rides taken per year at a fare of $5 per ride.

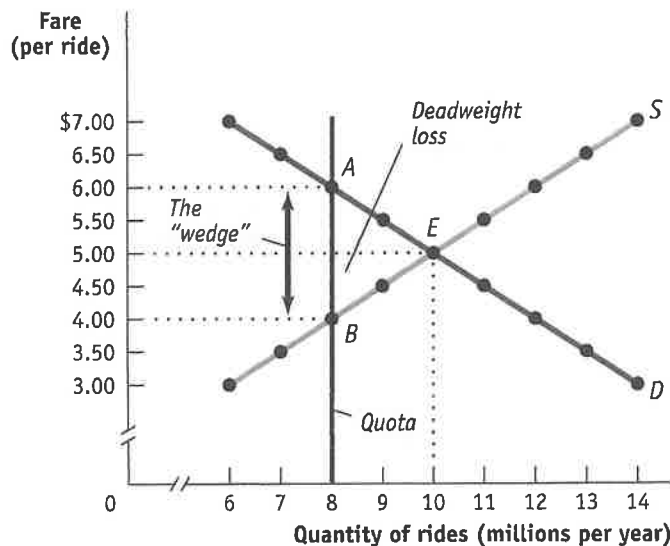Similarly, the supply curve represents the answer to questions of the form: "How many taxi rides would taxi drivers supply at a price of $5 each?" But we can also reverse this question to ask: "At what price will producers be willing to supply 10 million rides per year?" The price at which producers will supply a given quantity—in this case, 10 million rides at $5 per ride—is the **supply price** of that quantity. We can see from the supply schedule in Figure 9.1 that the supply price of 6 million rides is $3 per ride, the supply price of 7 million rides is $3.50 per ride, and so on.

Now we are ready to analyze a quota. We have assumed that the city government limits the quantity of taxi rides to 8 million per year. Medallions, each of which carries the right to provide a certain number of taxi rides per year, are made available to selected people in such a way that a total of 8 million rides will be provided. Medallion holders may then either drive their own taxis or rent their medallions to others for a fee.

Figure 9.2 shows the resulting market for taxi rides, with the black vertical line at 8 million rides per year representing the quota. Because the quantity of rides is limited to 8 million, consumers must be at point A on the demand curve, corresponding to the shaded entry in the demand schedule: the demand price of 8 million rides is $6 per ride. Meanwhile, taxi drivers must be at point B on the supply curve, corresponding to the shaded entry in the supply schedule: the supply price of 8 million rides is $4 per ride.

But how can the price received by taxi drivers be $4 when the price paid by taxi riders is $6? The answer is that in addition to the market in taxi rides, there is also a market in medallions. Medallion-holders may not always want to drive their taxis: they may be ill or on vacation. Those who do not want to drive their own taxis will sell the right to use the medallion to someone else. So we need to consider two sets of transactions here, and so two prices: (1) the transactions in taxi rides and the price at which these will occur

Figure 9.2   Effect of a Quota on the Market for Taxi Rides

Fare (per ride)	Quantity of rides (millions per year)	
	Quantity demanded	Quantity supplied
$7.00	6	14
6.50	7	13
6.00	8	12
5.50	9	11
5.00	10	10
4.50	11	9
4.00	12	8
3.50	13	7
3.00	14	6

The table shows the demand price and the supply price corresponding to each quantity: the price at which that quantity would be demanded and supplied, respectively. The city government imposes a quota of 8 million rides by selling enough medallions for only 8 million rides, represented by the black vertical line. The price paid by consumers rises to $6 per ride, the demand price of 8 million rides, shown by point A.

The supply price of 8 million rides is only $4 per ride, shown by point B. The difference between these two prices is the quota rent per ride, the earnings that accrue to the owner of a medallion. The quota rent drives a wedge between the demand price and the supply price. Because the quota discourages mutually beneficial transactions, it creates a deadweight loss equal to the shaded triangle.

and (2) the transactions in medallions and the price at which these will occur. It turns out that since we are looking at two markets, the $4 and $6 prices will both be right.

To see how all of this works, consider two imaginary New York taxi drivers, Sunil and Harriet. Sunil has a medallion but can't use it because he's recovering from a severely sprained wrist. So he's looking to rent his medallion out to someone else. Harriet doesn't have a medallion but would like to rent one. Furthermore, at any point in time there are many other people like Harriet who would like to rent a medallion. Suppose Sunil agrees to rent his medallion to Harriet. To make things simple, assume that any driver can give only one ride per day and that Sunil is renting his medallion to Harriet for one day. What rental price will they agree on?

To answer this question, we need to look at the transactions from the viewpoints of both drivers. Once she has the medallion, Harriet knows she can make $6 per day—the demand price of a ride under the quota. And she is willing to rent the medallion only if she makes at least $4 per day—the supply price of a ride under the quota. So Sunil cannot demand a rent of more than $2—the difference between $6 and $4. And if Harriet offered Sunil less than $2—say, $1.50—there would be other eager drivers willing to offer him more, up to $2. So, in order to get the medallion, Harriet must offer Sunil at least $2. Since the rent can be no more than $2 and no less than $2, it must be exactly $2.

It is no coincidence that $2 is exactly the difference between $6, the demand price of 8 million rides, and $4, the supply price of 8 million rides. In every case in which the supply of a good is legally restricted, there is a **wedge** between the demand price of the quantity transacted and the supply price of the quantity transacted. This wedge, illustrated by the double-headed arrow in Figure 9.2, has a special name: the **quota rent**. It is the earnings that accrue to the medallion holder from ownership of a valuable commodity, the medallion. In the case of Sunil and Harriet, the quota rent of $2 goes to Sunil because he owns the medallion, and the remaining $4 from the total fare of $6 goes to Harriet.

So Figure 9.2 also illustrates the quota rent in the market for New York taxi rides. The quota limits the quantity of rides to 8 million per year, a quantity at which the demand price of $6 exceeds the supply price of $4. The wedge between these two prices, $2, is the quota rent that results from the restrictions placed on the quantity of taxi rides in this market.

But wait a second. What if Sunil doesn't rent out his medallion? What if he uses it himself? Doesn't this mean that he gets a price of $6? No, not really. Even if Sunil doesn't rent out his medallion, he could have rented it out, which means that the medallion has an *opportunity cost* of $2: if Sunil decides to use his own medallion and drive his own taxi rather than renting his medallion to Harriet, the $2 represents his opportunity cost of not renting out his medallion. That is, the $2 quota rent is now the rental income he forgoes by driving his own taxi. In effect, Sunil is in two businesses—the taxi-driving business and the medallion-renting business. He makes $4 per ride from driving his taxi and $2 per ride from renting out his medallion. It doesn't make any difference that in this particular case he has rented his medallion to himself! So regardless of whether the medallion owner uses the medallion himself or herself, or rents it to others, it is a valuable asset. And this is represented in the going price for a New York City taxi medallion. Notice, by the way, that quotas—like price ceilings and price floors—don't always have a real effect. If the quota were set at 12 million rides—that is, above the equilibrium quantity in an unregulated market—it would have no effect because it would not be binding.

The Costs of Quantity Controls

Like price controls, quantity controls can have some predictable and undesirable side effects. The first is the by-now-familiar problem of inefficiency due to missed opportunities: quantity controls prevent mutually beneficial transactions from occurring, transactions that would benefit both buyers and sellers. Looking back at Figure 9.2, you can see that starting at the quota of 8 million rides, New Yorkers would be willing to pay at least $5.50 per ride for an additional 1 million rides and that taxi drivers would be willing to provide those rides as long as they got at least $4.50 per ride. These are rides that would have taken place if there had been no quota. The same is true for the next 1 million rides: New Yorkers

New York City: An empty cab is hard to find.

A quantity control, or quota, drives a **wedge** between the demand price and the supply price of a good; that is, the price paid by buyers ends up being higher than that received by sellers. The difference between the demand and supply price at the quota amount is the **quota rent**, the earnings that accrue to the license-holder from ownership of the right to sell the good. It is equal to the market price of the license when the licenses are traded.

AP® Exam Tip

Drawing a quick graph using the data given will aid you in answering questions on quotas. For example, quota rent is simply the difference between the height of the demand curve and the height of the supply curve at the quota amount.

would be willing to pay at least $5 per ride when the quantity of rides is increased from to 10 million, and taxi drivers would be willing to provide those rides as long as they go at least $5 per ride. Again, these rides would have occurred without the quota. Only whe the market has reached the unregulated market equilibrium quantity of 10 million ride are there no "missed-opportunity rides"—the quota of 8 million rides has caused 2 mil lion "missed-opportunity rides." A buyer would be willing to buy the good at a price tha the seller would be willing to accept, but such a transaction does not occur because it i forbidden by the quota. Economists have a special term for the lost gains from misse opportunities such as these: **deadweight loss**. Generally, when the demand price exceed the supply price, there is a deadweight loss. Figure 9.2 illustrates the deadweight loss wit a shaded triangle between the demand and supply curves. This triangle represents th missed gains from taxi rides prevented by the quota, a loss that is experienced by bot disappointed would-be riders and frustrated would-be drivers.

Because there are transactions that people would like to make but are not allowed t quantity controls generate an incentive to evade them or even to break the law. New York taxi industry again provides clear examples. Taxi regulation applies only to those drive who are hailed by passengers on the street. A car service that makes prearranged pickup does not need a medallion. As a result, such hired cars provide much of the service tha might otherwise be provided by taxis, as in other cities. In addition, there are substanti numbers of unlicensed cabs that simply defy the law by picking up passengers withou a medallion. Because these cabs are illegal, their drivers are completely unregulated, an they generate a disproportionately large share of traffic accidents in New York City.

In fact, in 2004 the hardships caused by the limited number of New York taxis led cit leaders to authorize an increase in the number of licensed taxis. In a series of sales, th city sold more than 1,000 new medallions, to bring the total number up to the curren 13,257 medallions—a move that certainly cheered New York riders. But those who alread owned medallions were less happy with the increase; they understood that the near 1,000 new taxis would reduce or eliminate the shortage of taxis. As a result, taxi drive anticipated a decline in their revenues as they would no longer always be assured of fin ing willing customers. And, in turn, the value of a medallion would fall. So to placate th medallion owners, city officials also raised taxi fares: by 25% in 2004, and again—by a small percentage—in 2006 and 2012. Although taxis are now easier to find, a ride now costs more and that price increase slightly diminished the newfound cheer of New York taxi riders.

FYI The Clams of New Jersey

Forget the refineries along the Jersey Turnpike; one industry that New Jersey *really* dominates is clam fishing. In 2012 the Garden State supplied 50% of the country's surf clams, whose tongues are used in fried-clam dinners, and 53% of the quahogs, which are used to make clam chowder.

In the 1980s, however, excessive fishing threatened to wipe out New Jersey's clam beds. To save the resource, the U.S. government introduced a clam quota, which sets an overall limit on the number of bushels of clams that may be caught and allocates licenses to owners of fishing boats based on their historical catches.

A fried clam feast is a favorite on the Jersey shore.

Notice, by the way, that this is an example of a quota that is probably justified by broader economic and environmental considerations—unlike the New York taxicab quota, which has long since lost any economic rationale. Still, whatever its rationale, the New Jersey clam quota works the same way as any other quota.

Once the quota system was established, many boat owners stopped fishing for clams. They realized that rather than operate a boat part time, it was more profitable to sell or rent their licenses to someone else, who could then assemble enough licenses to operate a boat full time. Today, there are approximately 50 New Jersey boats fishing for clams; the license required to operate one is worth more than the boat itself.

Source: NOAA

Check Your Understanding

1. Suppose that the supply and demand for taxi rides is given by Figure 9.1 and a quota is set at 6 million rides. Replicate the graph from Figure 9.1, and identify each of the following on your graph:
   a. the price of a ride
   b. the quota rent
   c. the deadweight loss resulting from the quota.
   Suppose the quota on taxi rides is increased to 9 million.
   d. What happens to the quota rent and the dead-weight loss?

2. Again replicate the graph from Figure 9.1. Suppose that the quota is 8 million rides and that demand decreases due to a decline in tourism. Show on your graph the smallest parallel leftward shift in demand that would result in the quota no longer having an effect on the market.

Tackle the Test: Multiple-Choice Questions

Refer to the graph provided for Questions 1–3.
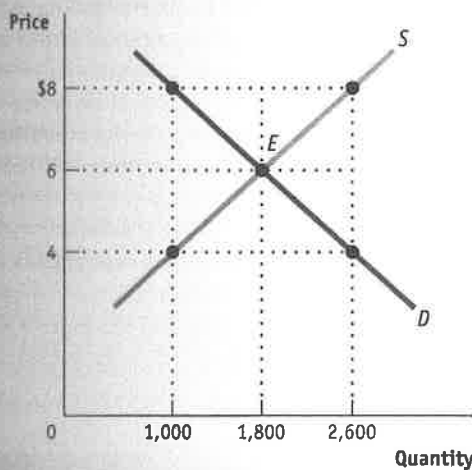
1. If the government established a quota of 1,000 in this market, the demand price would be
   a. less than $4.
   b. $4.
   c. $6.
   d. $8.
   e. more than $8.

2. If the government established a quota of 1,000 in this market, the supply price would be
   a. less than $4.
   b. $4.
   c. $6.
   d. $8.
   e. more than $8.

3. If the government established a quota of 1,000 in this market, the quota rent would be
   a. $2.
   b. $4.
   c. $6.
   d. $8.
   e. more than $8.

4. Quotas lead to which of the following?
   I. inefficiency due to missed opportunities
   II. incentives to evade or break the law
   III. a surplus in the market
   a. I
   b. II
   c. III
   d. I and II
   e. I, II, and III

5. Which of the following would decrease the effect a quota has on the quantity sold in a market?
   a. decrease in demand
   b. increase in supply
   c. increase in demand
   d. price ceiling above the equilibrium price
   e. none of the above

Tackle the Test: Free-Response Questions

1. Draw a correctly labeled graph illustrating hypothetical supply and demand curves for the U.S. automobile market. Label the equilibrium price and quantity. Suppose the government institutes a quota to limit automobile production. Draw a vertical line labeled "$Q_{ineffective}$" to show the level of a quota that would have no effect on the market. Draw a vertical line labeled "$Q_{effective}$" to show the level of a quota that would have an effect on the market. Shade in and label the deadweight loss resulting from the effective quota.

Rubric for FRQ 1 (5 points)
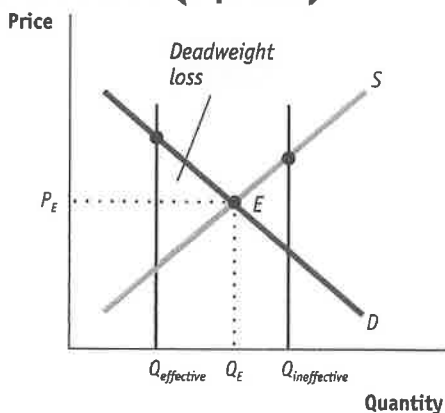
1 point: Correctly labeled supply and demand diagram (vertical axis labeled "Price" or "P," horizontal axis labeled "Quantity" or "Q," upward-sloping supply curve with label, downward-sloping demand curve with label)

1 point: Equilibrium at the intersection of supply and demand with the equilibrium price labeled on the vertical axis and the equilibrium quantity labeled on the horizontal axis

1 point: Vertical line to the right of equilibrium quantity labeled $Q_{ineffective}$

1 point: Vertical line to the left of equilibrium quantity labeled $Q_{effective}$

1 point: The triangle to the right of the effective quota line and to the left of supply and demand shaded in and labeled as the deadweight loss

2. Draw a correctly labeled graph of the market for taxicab rides. On the graph, draw and label a vertical line showing the level of an effective quota. Label the demand price, the supply price, and the quota rent.

   (6 points)

SECTION 2 Review

▶ Section 2 Review Video

Module 5

1. The **supply and demand model** illustrates how a **competitive market**, one with many buyers and sellers of the same product, works.

2. The **demand schedule** shows the **quantity demanded** at each price and is represented graphically by a **demand curve**. The **law of demand** says that demand curves slope downward, meaning that as price decreases, the quantity demanded increases.

3. A **movement along the demand curve** occurs when the price changes and causes a change in the quantity demanded. When economists talk of **changes in demand**, they mean shifts of the demand curve—a change in the quantity demanded at any given price.

An increase in demand causes a rightward shift of the demand curve. A decrease in demand causes a leftward shift.

4. There are five main factors that shift the demand curve:
   - A change in the prices of related goods, such as substitutes or complements
   - A change in income: when income rises, the demand for **normal goods** increases and the demand for **inferior goods** decreases
   - A change in tastes
   - A change in expectations
   - A change in the number of consumers

Module 6

5. The **supply schedule** shows the **quantity supplied** at each price and is represented graphically by a **supply curve**. According to the **law of supply**, supply curves slope upward, meaning that as price increases, the quantity demanded increases.

6. A **movement along the supply curve** occurs when the price changes and causes a change in the quantity supplied. When economists talk of **changes in supply**, they mean shifts of the supply curve—a change in the quantity supplied at any given price. An increase in

supply causes a rightward shift of the supply curve. A decrease in supply causes a leftward shift.

7. There are five main factors that shift the supply curve:

- A change in **input** prices
- A change in the prices of related goods and services
- A change in technology
- A change in expectations
- A change in the number of producers

Module 7

8. An economic situation is in **equilibrium** when no individual would be better off doing something different. The supply and demand model is based on the principle that the price in a market moves to its **equilibrium price**, or **market-clearing price**, the price at which the quantity demanded is equal to the quantity supplied. This quantity is the **equilibrium quantity**. When the price is above its market-clearing level, there is a **surplus** that pushes the price down. When the price is below its market-clearing level, there is a **shortage** that pushes the price up.

9. An increase in demand increases both the equilibrium price and the equilibrium quantity; a decrease in

demand has the opposite effect. An increase in supply reduces the equilibrium price and increases the equilibrium quantity; a decrease in supply has the opposite effect.

10. Shifts of the demand curve and the supply curve can happen simultaneously. When they shift in opposite directions, the change in price is predictable but the change in quantity is not. When they shift in the same direction, the change in quantity is predictable but the change in price is not. In general, the curve that shifts the greater distance has a greater effect on the changes in price and quantity.

Module 8

11. Even when a market is efficient, governments often intervene to pursue greater fairness or to please a powerful interest group. Interventions can take the form of **price controls** or quantity controls, both of which generate predictable and undesirable side effects, consisting of various forms of inefficiency and illegal activity.

12. A **price ceiling**, a maximum market price below the equilibrium price, benefits successful buyers but creates persistent shortages. Because the price is maintained below the equilibrium price, the quantity demanded is increased and the quantity supplied is decreased compared to the equilibrium quantity. This leads to predictable problems including **inefficient allocation to consumers, wasted resources**, and **inefficiently low quality**. It also encourages illegal activity as people turn to **black markets** to get the good. Because of these problems, price ceilings have generally lost favor as an

economic policy tool. But some governments continue to impose them either because they don't understand the effects or because the price ceilings benefit some influential group.

13. A **price floor**, a minimum market price above the equilibrium price, benefits successful sellers but creates a persistent surplus: because the price is maintained above the equilibrium price, the quantity demanded is decreased and the quantity supplied is increased compared to the equilibrium quantity. This leads to predictable problems: inefficiencies in the form of **inefficient allocation of sales among sellers**, wasted resources, and **inefficiently high quality**. It also encourages illegal activity and black markets. The most well-known kind of price floor is the **minimum wage**, but price floors are also commonly applied to agricultural products.

Module 9

14. **Quantity controls**, or **quotas**, limit the quantity of a good that can be bought or sold. The government issues **licenses** to individuals, the right to sell a given quantity of the good. The owner of a license earns a **quota rent**, earnings that accrue from ownership of the right to sell the good. It is equal to the difference between the **demand price** at the quota amount, what consumers are willing to pay for that amount, and the **supply price** at the quota amount, what suppliers are willing to accept for that amount. Economists say that a quota drives a **wedge** between the demand price and the supply price; this wedge is equal to the quota rent. By limiting mutually beneficial transactions, quantity controls generate inefficiency. Like price controls, quantity controls lead to **deadweight loss** and encourage illegal activity.

Key Terms

## AP® Exam Practice Questions

Multiple-Choice Questions

1. Which of the following changes will most likely result in an increase in the demand for hamburgers in your hometown?
   a. The price of hotdogs decreases.
   b. The price of drinks sold at hamburger restaurants increases.
   c. Income in your town decreases and hamburgers are a normal good.
   d. The local newspaper publishes a story on health problems caused by red meat.
   e. The number of vegetarians in your town decreases and the population size remains the same.

2. Which of the following changes will most likely result in a decrease in the supply of guitars?
   a. The popularity of guitar music increases.
   b. Consumer incomes decrease.
   c. A new firm enters the guitar industry.
   d. The guitar-making process is reengineered to be more efficient.
   e. The wages of guitar makers increase.

3. Which of the following will most likely result in a decrease in the quantity of lemons demanded?
   a. an increase in the price of lemons
   b. an increase in the price of limes
   c. an increase in the price of lemonade
   d. an increase in the number of lemonade stands
   e. a decrease in consumer income

4. Which of the following will occur if consumer incomes increase?
a. The demand for inferior goods will increase.
b. The demand for normal goods will increase.
c. The demand for all goods will increase.
d. The demand for normal goods will decrease.
e. The demand for all goods will decrease.

5. If two goods are complements, an increase in the price of one good will cause which of the following?
a. a decrease in the demand for the other
b. a decrease in the quantity demanded of the other
c. an increase in the demand for the other
d. an increase in the quantity demanded of the other
e. no change in the demand for the other

6. An increase in the wages of workers producing a good will most likely lead to which of the following?
a. a decrease in the quantity of the good supplied
b. a decrease in the supply of the good
c. an increase in the quantity of the good supplied
d. an increase in the supply of the good
e. no change in the supply of the good

7. Which of the following is true at the equilibrium price in a market?
a. Consumers who purchase the good may be better off buying something else instead.
b. The market has not yet cleared.
c. There is a tendency for the price to decrease over time.
d. There may be either a surplus or a shortage of the good.
e. The quantity demanded of the good equals the quantity supplied.

8. A survey indicated that chocolate is America's favorite ice cream flavor. Which of the following will lead to a decrease in the price of chocolate ice cream?
a. A drought in the Midwest causes farmers to reduce the number of dairy cows they raise.
b. A new report from the American Medical Association concludes that chocolate has significant health benefits.
c. The price of vanilla ice cream increases.
d. New freezer technology lowers the cost of producing ice cream.
e. The price of ice cream toppings decreases.

9. Which of the following events will increase both the price and the quantity of pizza?
a. The price of mozzarella cheese increases.
b. New health hazards of eating pizza are widely publicized.
c. The price of pizza ovens rises.
d. Consumers expect the price of pizza to fall next week.
e. Consumer income falls and pizza is an inferior good.

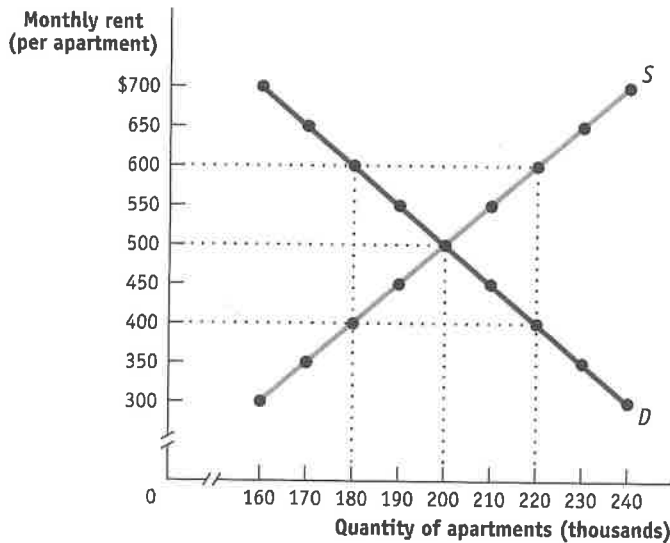*Use the following situation and diagram to answer Questions 10–15.*

For the last 70 years, the U.S. government has used price supports to provide income assistance to U.S. farmers. At times, the government has used price floors, which it maintains by buying up the surplus farm products. At other times, it has used target prices, giving the farmer an amount equal to the difference between the market price and the target price for each unit sold.
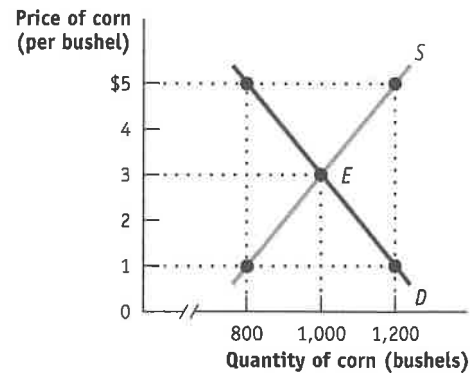
10. What are the equilibrium price and quantity in the market for corn?

	Price	Quantity
a.	$1	800
b.	$1	1,200
c.	$3	1,000
d.	$5	800
e.	$5	1,200

11. If the government sets a price floor of $5 per bushel, how many bushels of corn are produced?
a. 0
b. 400
c. 800
d. 1,000
e. 1,200

12. If the government sets a price floor of $5 per bushel, how many bushels of corn are purchased by consumers?
a. 0
b. 400
c. 800
d. 1,000
e. 1,200

13. How many bushels of corn are purchased by the government if it maintains a price floor of $5 by buying all surplus corn?
a. 0
b. 400
c. 800
d. 1,000
e. 1,200

14. How much does a price floor of $5 cost the government if it maintains the price floor by buying any surplus corn?
a. $0
b. $2,000
c. $4,000
d. $5,000
e. $6,000

15. How much revenue do corn farmers receive if there is a price floor at $5?
a. $0
b. $1,200
c. $3,000
d. $4,000
e. $6,000

Use the following diagram to answer Questions 16–20.

Monthly rent (per apartment) vs. Quantity of apartments (thousands)

16. Where must an effective price ceiling in this market be set?
a. at $500
b. above $400
c. above $500
d. below $600
e. below $500

17. If the government sets a price ceiling at $400, how many apartments will be demanded by consumers?
a. 0
b. 40,000
c. 180,000
d. 200,000
e. 220,000

18. How many apartments will be offered for rent if the government sets a price ceiling at $400?
a. 0
b. 40,000
c. 180,000
d. 200,000
e. 220,000

19. A price ceiling set at $400 will result in which of the following in the market for apartments?
a. a surplus of 40,000 apartments
b. a surplus of 220,000 apartments
c. no surplus or shortage
d. a shortage of 40,000 apartments
e. a shortage of 220,000 apartments

20. A price ceiling set at $600 will result in which of the following in the market for apartments?
a. a surplus of 40,000 apartments
b. a surplus of 220,000 apartments
c. no surplus or shortage
d. a shortage of 40,000 apartments
e. a shortage of 220,000 apartments

Refer to the following table and information to answer Questions 21–24.

Only fishing boats licensed by the U.S. government are allowed to catch swordfish in the waters off the North Atlantic coast. The following table shows hypothetical demand and supply schedules for swordfish caught in the United States each year.

Price of swordfish (per pound)	Quantity of swordfish (millions of pounds per year)	
	Quantity demanded	Quantity supplied
$20	6	15
18	7	13
16	8	11
14	9	9
12	10	7

21. If the government establishes a quota of 7 million pounds in the market, what will the demand price of swordfish be (per pound)?
  a. $20
  b. $18
  c. $16
  d. $14
  e. $12

22. If the government establishes a quota of 7 million pounds in the market, what will the supply price of swordfish be (per pound)?
  a. $20
  b. $18
  c. $16
  d. $14
  e. $12

23. What is the quota rent per pound of swordfish received by licensed fishing boats when the government sets a quota of 7 million pounds?
  a. $0
  b. $6
  c. $12
  d. $18
  e. $30

24. If there is a quota of 7 million pounds and swordfish fishing licenses are traded in a market, how much will the price of a fishing license be per pound?
  a. $0
  b. $6
  c. $12
  d. $18
  e. $30

25. When transactions do not occur due to price or quantity controls, what is the term for the lost gains?
  a. wasted resources
  b. inefficient quality
  c. price wedge
  d. black market losses
  e. deadweight loss

Free-Response Question

1. Pablo Picasso died having painted only 1,000 paintings during his "Blue Period."
  a. Draw a correctly labeled graph of the market for Picasso "Blue Period" paintings showing each of the following:
    i. the supply and demand curves for paintings
    ii. the equilibrium price and quantity of paintings
  b. List the five principal factors that will lead to a change in the price of paintings in this market.
  c. Show the effect on price in your market for paintings if wealthy art collectors decide that it is essential to acquire Picasso "Blue Period" paintings for their collections.

  (5 points)