chapter 3

>>Supply and Demand

What you will learn in this chapter:

- What a **competitive market** is and how it is described by the **supply and demand model**
- What the **demand curve** is and what the **supply curve** is
- The difference between **movements along a curve** and **shifts of a curve**
- How the supply and demand curves determine a market's **equilibrium price** and **equilibrium quantity**
- In the case of a **shortage** or **surplus,** how price moves the market back to equilibrium

GRETZKY'S LAST GAME

THERE ARE SEVERAL WAYS YOU CAN GET tickets for a sporting event. You might have a season pass that gives you a seat at every home game, you could buy a ticket for a single game from the box office, or you could buy a ticket from a *scalper*. Scalpers buy tickets in advance—either from the box office or from season ticket-holders who decide to forgo the game—and then resell them shortly before the event.

Scalping is not always legal, but it is often profitable. A scalper might buy tickets at the box office and then, after the box office has sold out, resell them at a higher price to fans who have decided at the last minute to attend the event. Of course, the profits are not guaranteed. Sometimes an event is unexpectedly "hot" and scalped tickets can be sold for high prices, but sometimes an event is unexpectedly "cold" and scalpers end up selling at a loss. Over time, however, even with some unlucky nights, scalpers can make money from eager fans.

Ticket scalpers in the Canadian city of Ottawa had a good few days in April 1999. Why? Because Wayne Gretzky, the Canadian hockey star, unexpectedly announced that he would retire from the sport and that the April 15 match between the Ottawa Senators and his team, the New York Rangers, would be his last game on Canadian soil. Many Canadian fans wanted to see the great Gretzky play one last time—and would not give up just because the box office had long since sold out.

Clearly, scalpers who had already stocked up on tickets—or who could acquire more tickets—were in for a bonanza. After the announcement, scalped tickets began selling for four or five times their face value. It was just a matter of supply and demand.

Shelly/Castellanos/Zuma

AFB/Corbis


Ronal Siemoneit/Corbis

Fans paid hundreds, even thousands, of dollars to see Wayne Gretzky and Michael Jordan play their last games. How much would you pay to see a music star, such as Jennifer Lopez, one last time? What about your favorite athlete?

But what do we mean by that? Many people use *supply and demand* as a sort of 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 how a market behaves* that is extremely useful for understanding many—but not all—markets.

In this chapter, 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 many—but not all—markets behave.

Supply and Demand: A Model of a Competitive Market

Ticket scalpers and their customers constitute a market—a group of sellers and buyers. More than that, they constitute a particular type of market, known as a competitive market. Roughly, a **competitive market** is a market 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.

A **competitive market** is a market in which there are many buyers and sellers of the same good or service.

It's a little hard to explain why competitive markets are different from other markets until we've seen how a competitive market works. So let's take a rain check—we'll return to that issue at the end of this chapter. 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.

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

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

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 *equilibrium price*
- The way the equilibrium price changes when the supply or demand curves shift

To understand the supply and demand model, we will examine each of these elements.

The Demand Curve

How many people wanted to buy scalped tickets to see the New York Rangers and the Ottawa Senators play that April night? You might at first think the answer was: every hockey fan in Ontario who didn't already have a ticket. But although every hockey fan wanted to see Wayne Gretzky play one last time, most fans weren't willing to pay four or five times the normal ticket price. In general, the number of people who want to buy a hockey ticket, or any other good, depends on the price. The higher the price, the fewer people who want to buy the good; the lower the price, the more people who want to buy the good.

So the answer to the question "How many people will want to buy a ticket to Gretzky's last game?" depends on the price of a ticket. If you don't yet know what the price will be, you can start by making a table of how many tickets 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** shows how much of a good or service consumers will want to buy at different prices.

A **demand schedule** is a table showing how much of a good or service consumers will want to buy at different prices. At the right of Figure 3-1, we show a hypothetical demand schedule for tickets to a hockey game.

According to the table, if scalped tickets are available at $100 each (roughly their face value), 20,000 people are willing to buy them; at $150, some fans will decide this price is too high, and only 15,000 are willing to buy. At $200, even fewer people want tickets, and so on. So the higher the price, the fewer the tickets people want to purchase. In other words, as the price rises, the quantity of tickets demanded falls.

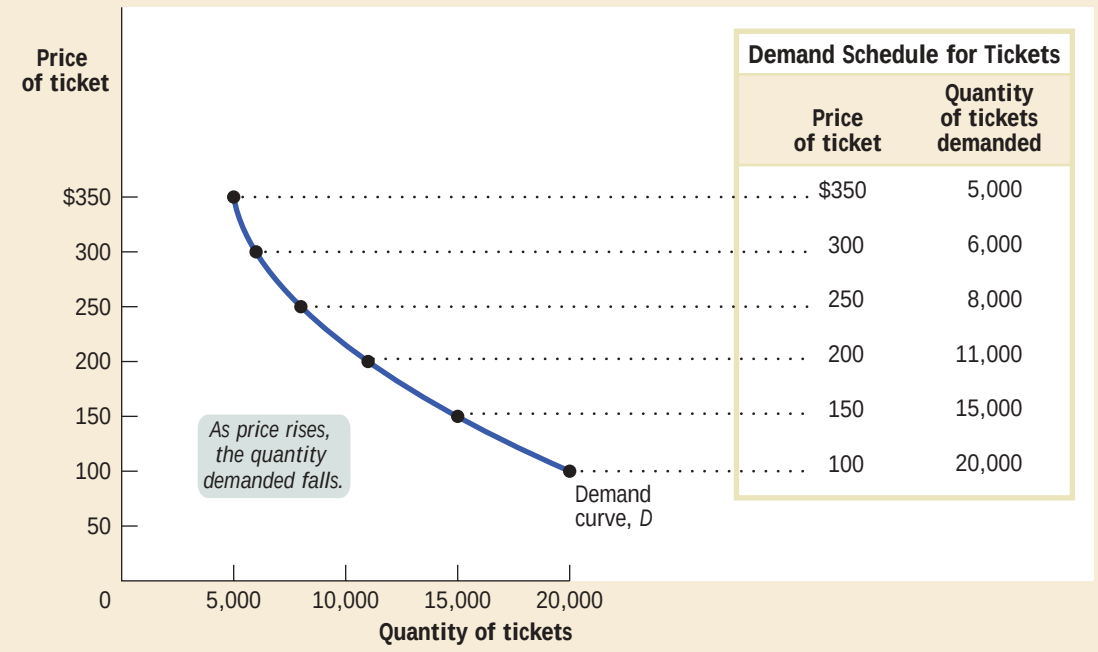
A **demand curve** is a graphical representation of the demand schedule. It shows how much of a good or service consumers want to buy at any given price.

The graph in Figure 3-1 is a visual representation of the information in the table. (You might want to review the discussion of graphs in economics in the appendix to Chapter 2.) The vertical axis shows the price of a ticket, and the horizontal axis shows the quantity of tickets. Each point on the graph corresponds to one of the entries in the table. The curve that connects these points is a **demand curve**. A demand curve is a graphical representation of the demand schedule, another way of showing how much of a good or service consumers want to buy at any given price.

The **quantity demanded** is the actual amount consumers are willing to buy at some specific price.

Suppose scalpers are charging $250 per ticket. We can see from Figure 3-1 that 8,000 fans are willing to pay that price; that is, 8,000 is the **quantity demanded** at a price of $250.

Figure 3-1 The Demand Schedule and the Demand Curve



Demand Schedule for Tickets

Price of ticket	Quantity of tickets demanded
$350	5,000
300	6,000
250	8,000
200	11,000
150	15,000
100	20,000

The demand schedule for tickets is plotted to yield the corresponding demand curve, which shows how much of a good 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.

Note that the demand curve shown in Figure 3-1 slopes downward. This reflects the general proposition that a higher price reduces the number of people willing to buy a good. In this case, many people who would lay out $100 to see the great Gretzky aren't willing to pay $350. In the real world, demand curves almost always, with some very specific exceptions, *do* slope downward. The exceptions are goods called "Giffen goods," but economists think these are so rare that for practical purposes we can ignore them. Generally, the proposition that a higher price for a good, *other things equal*, leads people to demand a smaller quantity of that good is so reliable that economists are willing to call it a "law"—the **law of demand**.

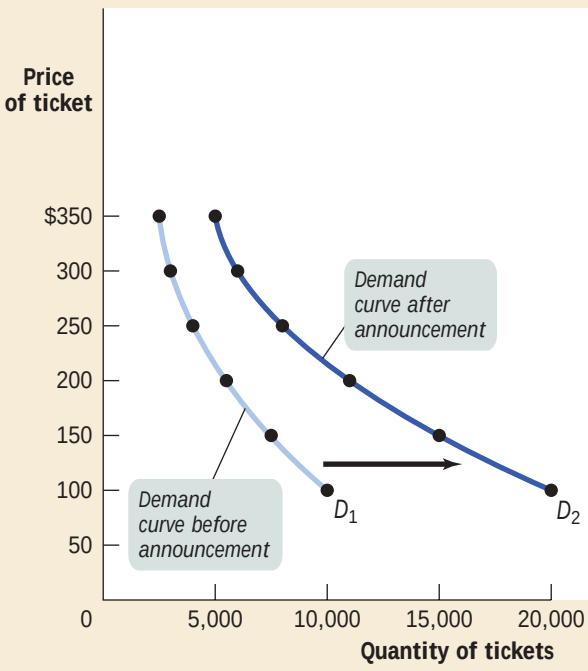
The **law of demand** says that a higher price for a good, other things equal, leads people to demand a smaller quantity of the good.

Shifts of the Demand Curve

When Gretzky's retirement was announced, the immediate effect was that more people were willing to buy tickets for that April 15 game at any given price. That is, at every price the quantity demanded rose as a consequence of the announcement. Figure 3-2 illustrates this phenomenon in terms of the demand schedule and the demand curve for scalped tickets.

The table in Figure 3-2 shows two demand schedules. The second one shows the demand schedule after the announcement, the same one shown in Figure 3-1. But the first demand schedule shows the demand for scalped tickets *before* Gretzky announced his retirement. As you can see, after the announcement the number of people willing to pay $350 for a ticket increased, the number willing to pay $300 increased, and so on. So at each price, the second schedule—the schedule after the announcement—shows a larger quantity demanded. For example, at $200, the quantity of tickets fans were willing to buy increased from 5,500 to 11,000.

Figure 3-2 An Increase in Demand



Demand Schedules for Tickets		
	Quantity of tickets demanded	
Price of ticket	Before announcement	After announcement
$350	2,500	5,000
300	3,000	6,000
250	4,000	8,000
200	5,500	11,000
150	7,500	15,000
100	10,000	20,000

Announcement of Gretzky's retirement generates an increase in demand—a rise in the quantity demanded at any given price. This event is represented by the two demand schedules—one showing demand before the announcement, the other showing demand after the announcement—and their corresponding demand curves. The increase in demand shifts the demand curve to the right.

A **shift of the demand curve** is a change in the quantity demanded at any given price, represented by the change of the original demand curve to a new position, denoted by a new demand curve.

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.

The announcement of Gretzky's retirement generated a *new* demand schedule, one in which the quantity demanded is greater at any given price than in the original demand schedule. The two curves in Figure 3-2 show the same information graphically. As you can see, the new demand schedule after the announcement corresponds to a new demand curve, D_2, that is to the right of the demand curve before the announcement, D_1. This **shift of the demand curve** shows the change in the quantity demanded at any given price, represented by the change 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 shifts of the demand curve 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 3-3 illustrates the difference.

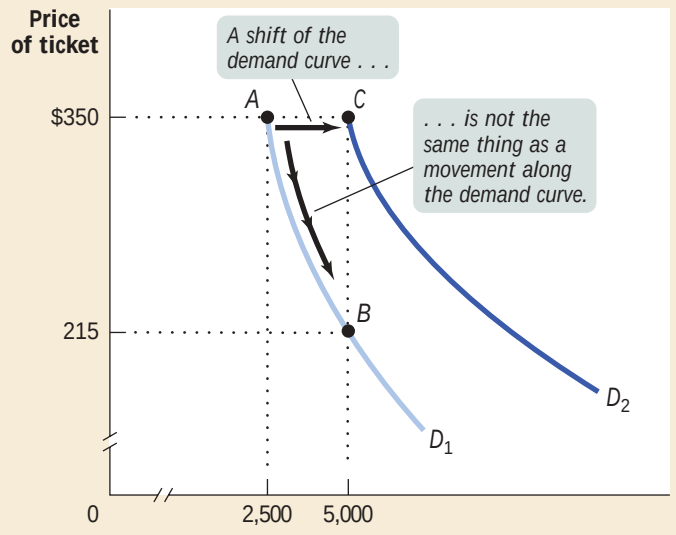
The movement from point *A* to point *B* is a movement along the demand curve: the quantity demanded rises due to a fall in price as you move down D_1. Here, a fall in price from $350 to $215 generates a rise in the quantity demanded from 2,500 to 5,000 tickets. But the quantity demanded can also rise when the price is unchanged if there is an increase in demand—a rightward shift of the demand curve. This is illustrated in Figure 3-3 by the shift of the demand curve from D_1 to D_2. Holding price constant at $350, the quantity demanded rises from 2,500 tickets at point *A* on D_1 to 5,000 tickets at point *C* on D_2.

When economists say "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.

Figure 3-3

Movement Along the Demand Curve Versus Shift of the Demand Curve

The rise in 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 quantity demanded when going from point *A* to point *C* reflects a shift of the demand curve: it is the result of a rise in the quantity demanded at any given price.



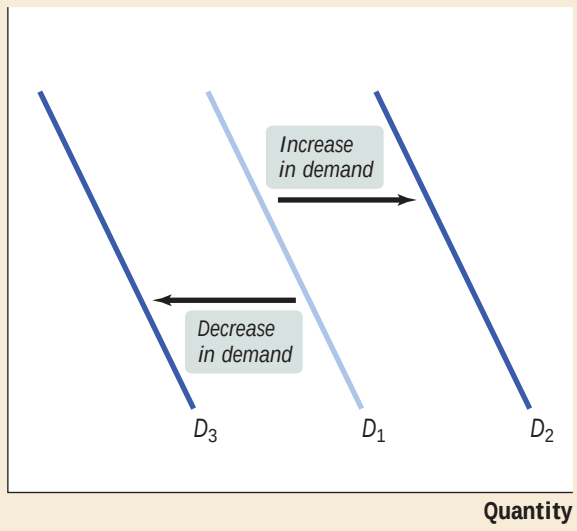
Understanding Shifts of the Demand Curve

Figure 3-4 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 than before. This is shown in Figure 3-4 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 than before. This is shown in Figure 3-4 by the leftward shift of the original demand curve D_1 to D_3.

Figure 3-4

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.



But what causes a demand curve to shift? In our example, the event that shifts the demand curve for tickets is the announcement of Gretzky's imminent retirement. But if you think about it, you can come up with other things that would be likely to shift the demand curve for those tickets. For example, suppose there is a music concert the same evening as the hockey game, and the band announces that it will sell tickets at half-price. This is likely to cause a decrease in demand for hockey tickets: hockey fans who also like music will prefer to purchase half-price concert tickets rather than hockey game tickets.

Economists believe that there are four principal factors that shift the demand curve for a good:

- Changes in the prices of related goods
- Changes in income
- Changes in tastes
- Changes in expectations

Although this is not an exhaustive list, it contains the four most important factors that can shift demand curves. When we said before that the quantity of a good demanded falls as its price rises *other things equal,* we were referring to the factors that shift demand as remaining unchanged.

Changes in the Prices of Related Goods If you want to have a good night out but aren't too particular about what you do, a music concert is an alternative to the hockey game—it is what economists call a *substitute* for the hockey game. A pair of goods are **substitutes** if a fall in the price of one good (music concerts) makes consumers less willing to buy the other good (hockey games). Substitutes are usually goods that in some way serve a similar function: concerts and hockey games, muffins and doughnuts, trains and buses. A fall in the price of the alternative good induces some consumers to purchase it *instead of* the original good, shifting the demand for the original good to the left.

Two goods are **substitutes** if a fall in the price of one of the goods makes consumers less willing to buy the other good.

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: sports tickets and parking at the stadium garage, hamburgers and buns, cars and gasoline. If the garage next to the hockey arena offered free parking, more people would be willing to buy tickets to see

Two goods are **complements** if a fall in the price of one good makes people more willing to buy the other good.

the game at any given price because the cost of the "package"—game plus parking—would have fallen. When the price of a complement falls, the quantity of the original good demanded at any given price rises; so the demand curve shifts to the right.

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.

When a rise in income increases the demand for a good—the normal case—we say that the good is a **normal good.**

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

Why do we say "most goods," not "all goods"? Most goods are **normal goods**—the demand for them increases when consumer income rises. However, the demand for some products falls when incomes rise—people with high incomes are less likely to take buses than people with lower incomes. Goods for which the demand decreases when income rises are known as **inferior goods**. When a good is inferior, a rise in income shifts the demand curve to the left.

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 GIs adopted a more informal style, perhaps due to the rigors of the war. And, President Eisenhower, who had been supreme commander of Allied Forces, often went hatless. The demand curve for hats had shifted leftward, reflecting a decline in the demand for hats.

The main distinguishing feature of changes in tastes is that economists have little to say about them and usually take them as given. 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 You could say that the increase in demand for tickets to the April 15 hockey game was the result of a change in expectations: fans no longer expected to have future opportunities to see Gretzky in action, so they became more eager to see him while they could.

Depending on the specifics of the case, changes in expectations can either decrease or increase the demand for a good. For example, savvy shoppers often wait for seasonal sales—say, buying 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.

Expected changes in future income can also lead to changes in demand: if you expect your income to rise in the future, you will typically borrow today and increase your demand for certain goods; and if you expect your income to fall in the future, you are likely to save today and reduce your demand for some goods.

economics in action

Beating the Traffic

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 raising 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. (Short time limits on parking meters, combined with vigilant parking enforcement, is a related tactic.)

However, few cities have been willing to adopt the politically controversial direct approach: reducing congestion by raising the price of driving. So it was a shock when, in 2003, London imposed a "congestion charge" of £5 (about $8) on all cars entering the city center during business hours.

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 don't pay and are caught, a fine of £80 (about $130) 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: according to an August 2003 news report, traffic into central London had fallen 32 percent and cars were traveling more than a third faster as a result of the congestion charge. ■

>>QUICK REVIEW

- The *demand schedule* shows how the *quantity demanded* changes as the price changes. This relationship is illustrated by a *demand curve*.
- The *law of demand* asserts that demand curves normally slope downward—that is, a higher price reduces the quantity demanded.
- When economists talk about increases or decreases in demand, they mean *shifts of the demand curve.* An increase in demand is a rightward shift: the quantity demanded rises for any given price. A decrease in demand is a leftward shift: the quantity demanded falls for any given price. A change in price results in a *movement along the demand curve* and a change in the quantity demanded.
- The four main factors that can shift the demand curve are changes in (1) the price of a related good, such as a *substitute* or a *complement,* (2) income, (3) tastes, and (4) expectations.

>>CHECK YOUR UNDERSTANDING 3-1

1. Explain whether each of the following events represents (i) a *shift of* the demand curve or (ii) a *movement along* the demand curve.
   a. A store owner finds that customers are willing to pay more for umbrellas on rainy days.
   b. When XYZ Telecom, a long-distance provider, offered reduced rates on weekends, the 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. The sharp rise in the price of gasoline leads many commuters to join carpools in order to reduce their gasoline purchases.

Solutions appear at back of book.

The Supply Curve

Ticket scalpers have to acquire the tickets they sell, and many of them do so from ticket-holders who decide to sell. The decision of whether to sell your own ticket to a scalper depends in part on the price offered: the higher the price offered, the more likely that you will be willing to sell.

So just as the quantity of tickets that people are willing to buy depends on the price they have to pay, the quantity that people are willing to sell—the **quantity supplied**—depends on the price they are offered. (Notice that this is the supply of tickets *to the market in scalped tickets*. The number of seats in the stadium is whatever it is, regardless of the price—but that's not the quantity we're concerned with here.)

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

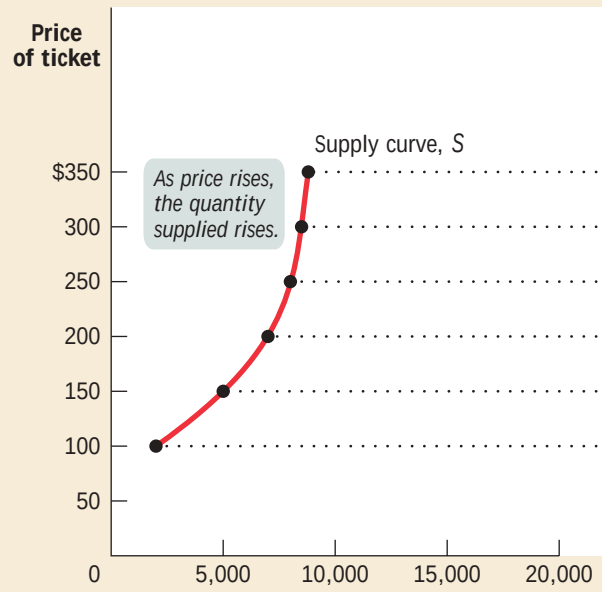
The Supply Schedule and the Supply Curve

The table in Figure 3-5 (page 54) shows how the quantity of tickets made available varies with the price—that is, it shows a hypothetical **supply schedule** for tickets to Gretzky's last game.

A supply schedule works the same way as the demand schedule shown in Figure 3-1: in this case, the table shows the quantity of tickets season subscribers are willing to sell at different prices. At a price of $100, only 2,000 people are willing to part with their tickets. At $150, some more people decide that it is worth passing up the game in order to have more money for something else, increasing the quantity of tickets available to 5,000. At $200, the quantity of tickets available rises to 7,000, and so on.

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

Figure 3-5 The Supply Schedule and the Supply Curve



Supply Schedule for Tickets	
Price of ticket	Quantity of tickets supplied
$350	8,800
300	8,500
250	8,000
200	7,000
150	5,000
100	2,000

The supply schedule for tickets is plotted to yield the corresponding supply curve, which shows how much of a good people 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.

A **supply curve** shows graphically how much of a good or service people are willing to sell at any given price.

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 3-5. Each point on the curve represents an entry from the table.

Suppose that the price scalpers offer rises from $200 to $250; we can see from Figure 3-5 that the quantity of tickets sold to them rises from 7,000 to 8,000. This is the normal situation for a supply curve, reflecting the general proposition that a higher price leads to a higher quantity supplied. So just as demand curves normally slope downward, supply curves normally slope upward: the higher the price being offered, the more hockey tickets people will be willing to part with—the more of any good they will be willing to sell.

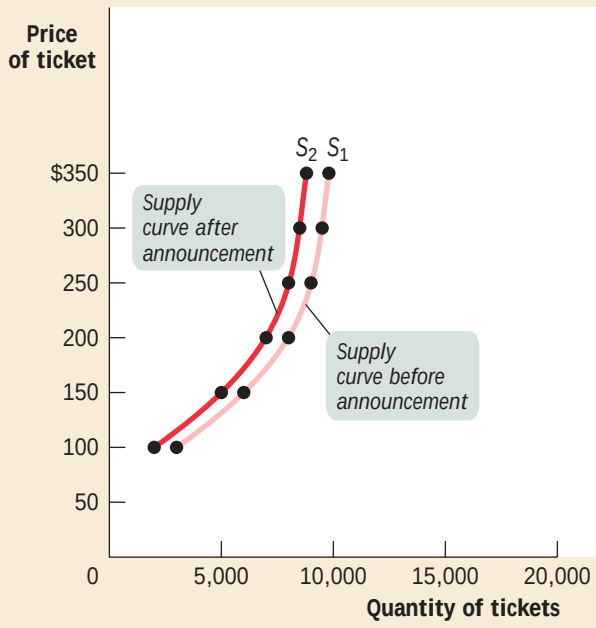
Shifts of the Supply Curve

When Gretzky's retirement was announced, the immediate effect was that people who already had tickets for the April 15 game became less willing to sell those tickets to scalpers at any given price. So the quantity of tickets supplied at any given price fell: the number of tickets people were willing to sell at $350 fell, the number they were willing to sell at $300 fell, and so on. Figure 3-6 shows us how to illustrate this event in terms of the supply schedule and the supply curve for tickets.

A **shift of the supply curve** is a change in the quantity supplied of a good at any given price. It is represented by the change of the original supply curve to a new position, denoted by a new supply curve.

The table in Figure 3-6 shows two supply schedules; the schedule after the announcement is the same one as in Figure 3-5. The first supply schedule shows the supply of scalped tickets *before* Gretzky announced his retirement. And 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 the quantity supplied at any given price. This is shown in Figure 3-6 by the shift of the supply curve before the announcement, S_1, to its new position after the announcement, S_2. Notice that S_2 lies to the left of S_1, a reflection of the fact that quantity supplied decreased at any given price in the aftermath of Gretzky's announcement.

Figure 3-6 A Decrease in Supply



Supply Schedules for Tickets

Price of ticket	Quantity of tickets supplied: Before announcement	After announcement
$350	9,800	8,800
300	9,500	8,500
250	9,000	8,000
200	8,000	7,000
150	6,000	5,000
100	3,000	2,000

Announcement of Gretzky's retirement generates a decrease in supply—a decrease in the quantity supplied at any given price. This event is represented by the two supply schedules—one showing supply before the announcement—the other showing supply after the announcement, and their corresponding supply curves. The decrease in supply shifts the supply curve to the left.

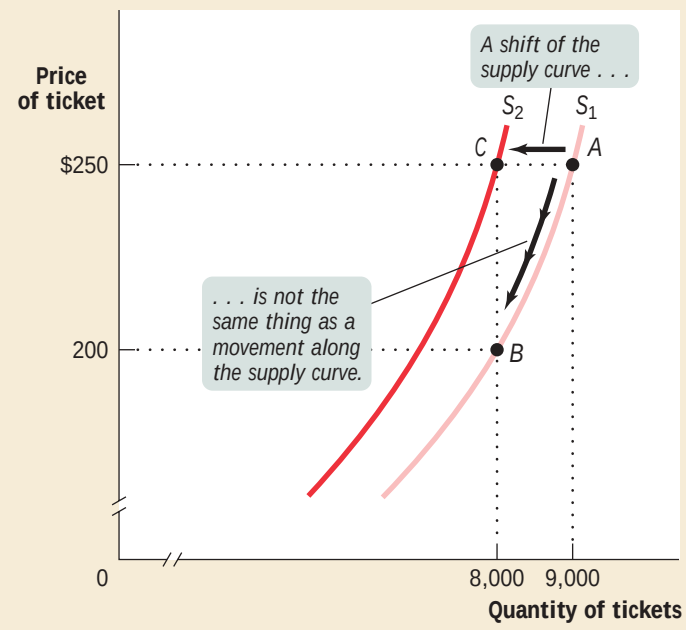
As in the analysis of demand, it's crucial to draw a distinction between such shifts of the supply curve and **movements along the supply curve**—changes in the quantity supplied that result from a change in price. We can see this difference in Figure 3-7. The movement from point *A* to point *B* is a movement along the supply curve: the quantity supplied falls along S_1 due to a fall in price. Here, a fall in price from

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

Figure 3-7

Movement Along the Supply Curve Versus Shift of the Supply Curve

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



$250 to $200 leads to a fall in the quantity supplied from 9,000 to 8,000 tickets. But the quantity supplied can also fall when the price is unchanged if there is a decrease in supply—a leftward shift of the supply curve. This is shown in Figure 3-7 by the leftward shift of the supply curve from S_1 to S_2. Holding price constant at $250, the quantity supplied falls from 9,000 tickets at point *A* on S_1 to 8,000 at point *C* on S_2.

Understanding Shifts of the Supply Curve

Figure 3-8 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, people will supply a larger quantity of the good than before. This is shown in Figure 3-8 by the shift to the right 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, people supply a smaller quantity of the good than before. This is represented in Figure 3-8 by the leftward shift of S_1 to S_3.

Economists believe that shifts of supply curves are mainly the result of three factors (though, as in the case of demand, there are other possible causes):

- Changes in input prices
- Changes in technology
- Changes in expectations

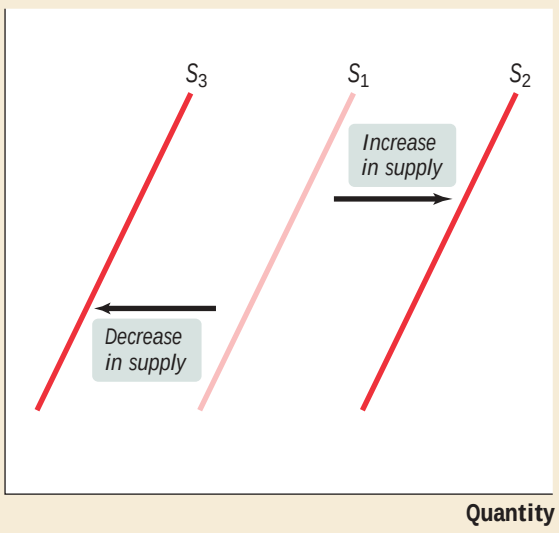
An **input** is a good that is used to produce another good.

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. (Actually, you only need vanilla beans to make *good* vanilla ice cream; see Economics in Action on page 66.) An **input** is any good that is used to produce another good. Inputs, like output, have prices. And an increase in the price of an input makes the production of the final good more costly for those who produce and sell the good. So sellers are less willing to supply the good at any given price, and the supply curve shifts to the left. For example, newspaper publishers buy large quantities of newsprint (the paper on which newspapers are printed). When newsprint prices rose sharply in 1994–1995, the supply of newspapers fell: several newspapers went out of business and a number of new publishing ventures were canceled. 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.

Figure 3-8

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.



Changes in Technology When economists talk about "technology," they don't necessarily mean high technology—they mean all the ways in which people can turn inputs into useful goods. The whole complex of activities that turns corn from an Iowa farm into cornflakes on your breakfast table is technology in this sense. And when a better technology becomes available, reducing the cost of production—that is, letting a producer spend less on inputs yet produce the same output—supply increases, and the supply curve shifts to the right. For example, an improved strain of corn that is more resistant to disease makes farmers willing to supply more corn at any given price.

Changes in Expectations Imagine that you had a ticket for the April 15 game but couldn't go. You'd want to sell the ticket to a scalper. But if you heard a credible rumor about Gretzky's imminent retirement, you would know that the ticket would soon skyrocket in value. So you'd hold off on selling the ticket until his decision to retire was made public. This illustrates how expectations can alter supply: an expectation that the price of a good will be higher in the future causes supply to decrease today, but an expectation that the price of a good will be lower in the future causes supply to increase today.

economics in action

Down (and Up) on the Farm

Many countries have designed farm policies based on the belief—or maybe the hope—that producers *won't* respond much to changes in the price of their product. But they have found out, to their dismay, that the price does indeed matter.

Advanced countries (including the United States) have historically tried to legislate farm prices *up*. (Chapter 4 describes how such price floors work in practice.) The point was to raise farmers' incomes, not to increase production—but production nonetheless did go up. Until the nations of the European Union began guaranteeing farmers high prices in the 1960s, they had limited agricultural production and imported much of their food. Once price supports were in place, production expanded rapidly, and European farmers began growing more grains and producing more dairy products than consumers wanted to buy.

In poorer countries, especially in Africa, governments have often sought to keep farm prices *down*. The typical strategy was to require farmers to sell their produce to a "marketing board," which then resold it to urban consumers or overseas buyers. A famous example is Ghana, once the world's main supplier of cocoa, the principal ingredient in chocolate. From 1965 until the 1980s, farmers were required to sell their cocoa beans to the government at prices that lagged steadily behind those chocolate manufacturers were paying elsewhere. The Ghanaian government hoped that cocoa production would be little affected by this policy and that it could profit by buying low and selling high. In fact, production fell sharply. By 1980, Ghana's share of the world market was down to 12 percent, while other cocoa-exporting countries that did not follow the same policy—including its African neighbors—were steadily increasing their sales.

Today Europe is trying to reform its agricultural policy, and most developing countries have abandoned their efforts to hold farm prices down. Governments seem finally to have learned that supply curves really do slope upward after all. ■

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>>CHECK YOUR UNDERSTANDING 3-2

1. Explain whether each of the following events represents (i) a *shift of* the supply curve or (ii) a *movement along* the supply curve.

a. More homeowners put their houses up for sale during a real estate boom that causes house prices to rise.

b. Many strawberry farmers open temporary roadside stands during harvest season, even though prices are usually low at that time.

continued

>>QUICK REVIEW

- The *supply schedule* shows how the *quantity supplied* depends on the price. The relationship between the two is illustrated by the *supply curve*.
- Supply curves are normally upward sloping: at a higher price, people are willing to supply more of the good.
- A change in price results in a *movement along the supply curve* and a change in the quantity supplied.
- As with demand, when economists talk of increases or decreases in supply, they mean *shifts of the supply curve*, not changes in the quantity supplied. An increase in supply is a rightward shift: the quantity supplied rises for any given price. A decrease in supply is a leftward shift: the quantity supplied falls for any given price.
- The three main factors that can shift the supply curve are changes in (1) input prices, (2) technology, and (3) expectations.

continued

c. Immediately after the school year begins, fast-food chains must raise wages to attract workers.
d. Many construction workers temporarily move to areas that have suffered hurricane damage, lured by higher wages offered.
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 berths, at lower prices, than before.

Solutions appear at back of book.

Supply, Demand, and Equilibrium

We have now covered the first three key elements in the supply and demand model: the supply curve, the demand 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 a good will be bought and sold.

What determines the price at which a good is bought and sold? In Chapter 1 we learned the general principle that *markets move toward equilibrium*, a situation in which no individual would be better off taking a different action. In the case of a competitive market, we can be more specific: a competitive market is in equilibrium when the price has moved to a level at which the quantity demanded of a good equals the quantity supplied of that good. 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.

A competitive market is in equilibrium when price has moved to a level at which the quantity demanded of a good equals the quantity supplied of that good. The price at which this takes place is the **equilibrium price**, also referred to as the **market-clearing price**. The quantity of the good bought and sold at that price is the **equilibrium quantity**.

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 finds a seller, and vice versa.

You may notice from this point on that we will no longer focus on middlemen such as scalpers but focus directly on the market price and quantity. Why? Because the function of a middleman is to bring buyers and sellers together to trade. But what makes buyers and sellers willing to trade is in reality not the middleman, but the price they agree upon—the equilibrium price. By going deeper and examining how price functions within a market, we can safely assume that the middlemen are doing their job and leave them in the background.

So, how do we find the equilibrium price and quantity?

PITFALLS

BOUGHT *AND* SOLD?

We have been talking about the price at which a good is bought *and* sold, as if the two were the same. But shouldn't we make a distinction between the price received by sellers and that paid by buyers? In principle, yes; but it is helpful at this point to sacrifice a bit of realism in the interests of simplicity—by assuming away the difference between the prices received by sellers and those paid by buyers. In reality, people who sell hockey tickets to scalpers, although they sometimes receive high prices, generally receive less than those who eventually buy these tickets pay. No mystery there: that difference is how a scalper or any other "middleman"—someone who brings buyers and sellers together—makes a living. In many markets, however, the difference between the buying and selling price is quite small. It is therefore not a bad approximation to think of the price paid by buyers as being the *same* as the price received by sellers. And that is what we will assume in the remainder of this chapter.

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.

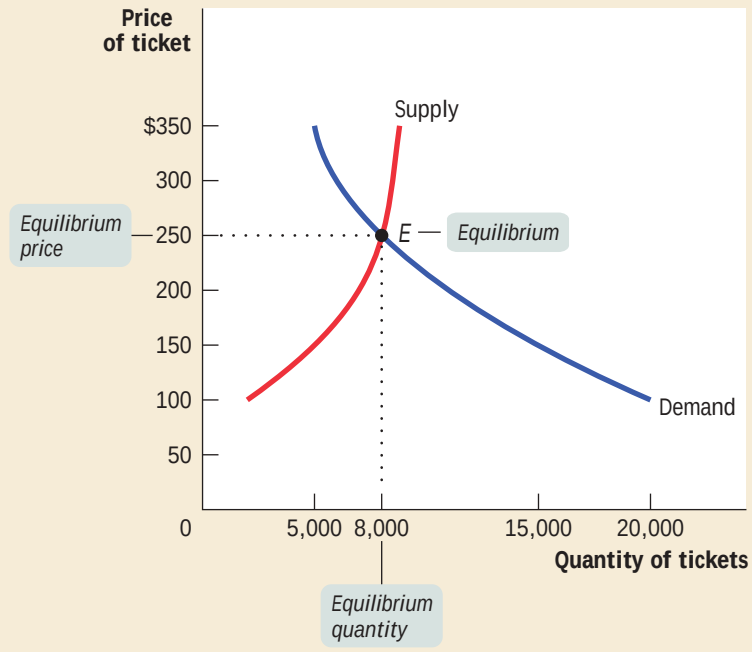
Figure 3-9 combines the demand curve from Figure 3-1 and the supply curve from Figure 3-5. They *intersect* at point *E*, which is the equilibrium of this market; that is, $250 is the equilibrium price and 8,000 tickets is the equilibrium quantity.

Let's confirm that point *E* fits our definition of equilibrium. At a price of $250 per ticket, 8,000 ticket-holders are willing to resell their tickets and 8,000 people who do not have tickets are willing to buy. So at the price of $250 the quantity of tickets 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. In other words, if the price were more than $250, the quantity supplied would exceed the quantity demanded; if the price were less than $250, the quantity demanded would exceed the quantity supplied.

Figure 3-9

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 $250 and the equilibrium quantity is 8,000 tickets.



The model of supply and demand, then, predicts that given the demand and supply curves shown in Figure 3-9, 8,000 tickets would change hands at a price of $250 each.

But how can we be sure that the market will arrive at the equilibrium price? We begin by answering three simpler 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?

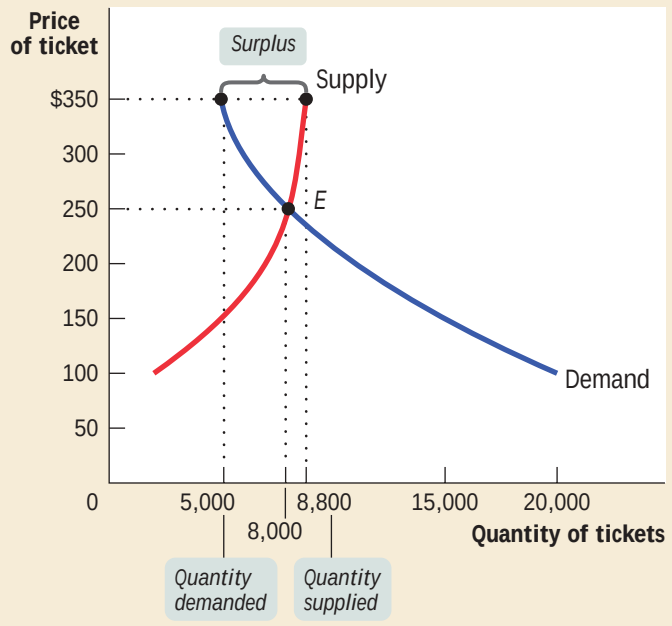
There are some markets where the same good can sell for many different prices, depending on who is selling or who is buying. For example, have you ever bought a souvenir in a "tourist trap" and then seen the same item on sale somewhere else (perhaps even in the next store) for a lower price? Because 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 where the buyers and sellers have both been around for some time, sales and purchases tend to converge at a generally uniform price, so that 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 to be paying. The buyer would clearly be better off shopping elsewhere—unless the seller was 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.*

Figure 3-10

Price Above Its Equilibrium Level Creates a Surplus

The market price of $350 is above the equilibrium price of $250. This creates a surplus: at $350 per ticket, suppliers would like to sell 8,800 tickets but fans are willing to purchase only 5,000, so there is a surplus of 3,800 tickets. This surplus will push the price down until it reaches the equilibrium price of $250.



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

Suppose the supply and demand curves are as shown in Figure 3-9 but the market price is above the equilibrium level of $250—say, $350. This situation is illustrated in Figure 3-10. Why can't the price stay there?

As the figure shows, at a price of $350 there would be more tickets available than hockey fans wanted to buy: 8,800 versus 5,000. The difference of 3,800 is the **surplus**—also known as the *excess supply*—of tickets at $350.

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

This surplus means that some would-be sellers are being frustrated: they cannot find anyone to buy what they want to sell. So the surplus offers an incentive for those 3,800 would-be sellers to offer a lower price in order to poach business from other sellers. It also offers an incentive for would-be buyers to seek a bargain by offering a lower price. Sellers who reject the lower price will fail to find buyers, and 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 price is above its equilibrium level.

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

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

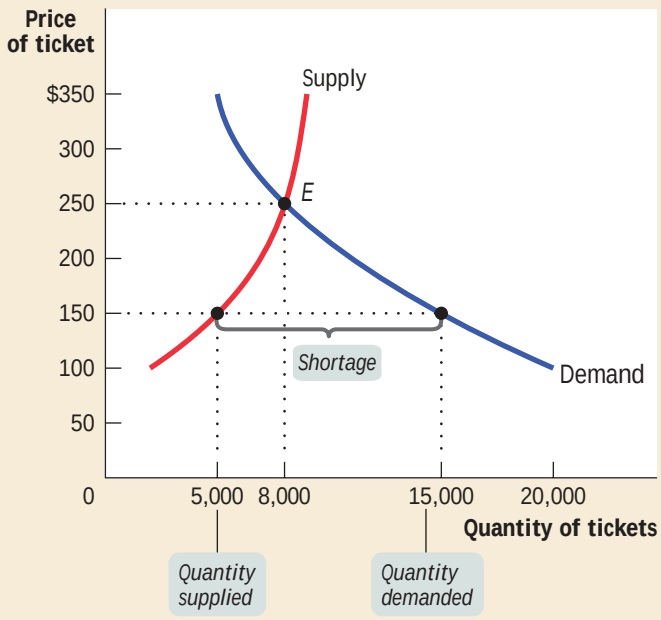
Now suppose the price is below its equilibrium level—say, at $150 per ticket, as shown in Figure 3-11. In this case, the quantity demanded (15,000 tickets) exceeds the quantity supplied (5,000 tickets), implying that there are 10,000 would-be buyers who cannot find tickets: there is a **shortage**, also known as an *excess demand*, of 10,000 tickets.

When there is a shortage, there are frustrated would-be buyers—people who want to purchase tickets 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 price will always rise if it is below the equilibrium level.

Figure 3-11

Price Below Its Equilibrium Level Creates a Shortage

The market price of $150 is below the equilibrium price of $250. This creates a shortage: fans want to buy 15,000 tickets but only 5,000 are offered for sale, so there is a shortage of 10,000 tickets. This shortage will push the price up until it reaches the equilibrium price of $250.



Using Equilibrium to Describe Markets

We have now seen that a market tends to have a single price; that the market price falls if it is above the equilibrium level but rises if it is below that level. So the market price always *moves toward* the equilibrium price, the price at which there is neither surplus nor shortage.

economics in action

A Fish Story

In market equilibrium, something remarkable supposedly happens: everyone who wants to sell a good finds a willing buyer, and everyone who wants to buy that good finds a willing seller. It's a beautiful theory—but is it realistic?

In New York City the answer can be seen every day, just before dawn, at the famous Fulton Fish Market, which has operated since 1835 (though it has moved from its original Fulton Street location). There, every morning, fishermen bring their catch and haggle over prices with restaurant owners, shopkeepers, and a variety of middlemen and brokers.

The stakes are high. Restaurant owners who can't provide their customers with the fresh fish they expect stand to lose a lot of business, so it's important that would-be buyers find willing sellers. It's even more important for fishermen to make a sale: unsold fish loses much, if not all, of its value. But the market does reach equilibrium: just about every would-be buyer finds a willing seller, and vice versa. The reason is that every day the price of each type of fish quickly converges to a level that matches the quantity supplied and the quantity demanded.

So the tendency of markets to reach equilibrium isn't just theoretical speculation. You can see (and smell) it happening, early every morning. ■

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>> QUICK REVIEW

- Price in a competitive market moves to the *equilibrium price,* or *market-clearing price,* where the quantity supplied is equal to the quantity demanded. This quantity is the *equilibrium quantity.*
- All sales and purchases in a market take place at the same price. If the price is above its equilibrium level, there is a *surplus* that drives the price down. If the price is below its equilibrium level, there is a *shortage* that drives the price up.

>>CHECK YOUR UNDERSTANDING 3-3

1. In the following three situations, the market is initially in equilibrium. After each instance described below, does a surplus or shortage exist at the original equilibrium price? What will happen to the equilibrium price as a result?
   a. 1997 was a very good year for California wine-grape growers, who produced a bumper-size crop.
   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 secondhand snowblowers at the local tool shop.

Solutions appear at back of book.

Changes in Supply and Demand

Wayne Gretzky's announcement that he was retiring may have come as a surprise, but the subsequent rise in the price of scalped tickets for that April game was no surprise at all. Suddenly the number of people who wanted to buy tickets at any given price increased—that is, there was an increase in demand. And at the same time, because those who already had tickets wanted to see Gretzky's last game, they became less willing to sell them—that is, there was a decrease in supply.

In this case, there was an event that shifted both the supply and the demand curves. However, in many cases something happens that shifts only one of the curves. For example, a freeze in Florida reduces the supply of oranges but doesn't change the demand. A medical report that eggs are bad for your health reduces the demand for eggs but does not affect the supply. That is, 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

Coffee and tea are substitutes: if the price of tea rises, the demand for coffee will increase, and if the price of tea falls, the demand for coffee will decrease. But how does the price of tea affect the *market* for coffee?

Figure 3-12 shows the effect of a rise in the price of tea on the market for coffee. The rise in the price of tea increases the demand for coffee. 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.

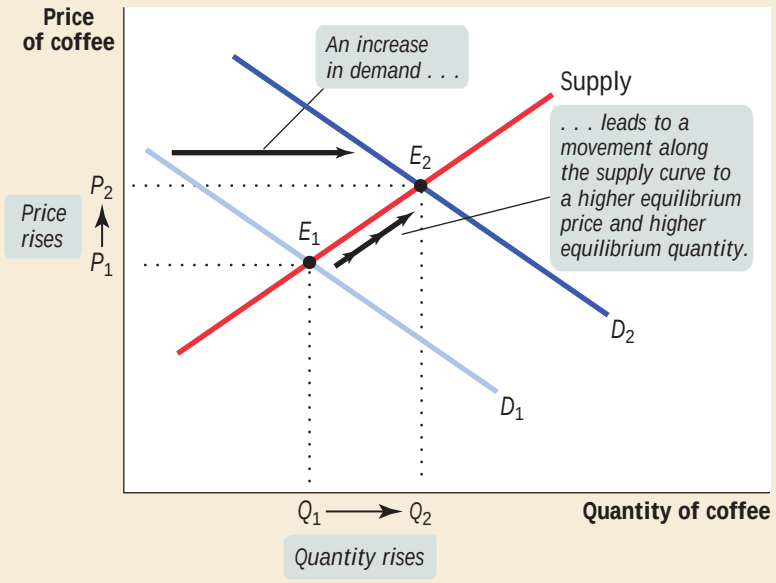
An increase in demand is indicated by a rightward *shift* of the demand curve from D_1 to D_2. At the original market price P_1, this market is no longer in equilibrium: a shortage occurs because the quantity demanded exceeds the quantity supplied. So the price of coffee rises and generates an increase 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 increases, the equilibrium price and the equilibrium quantity of the good both rise.*

And what would happen in the reverse case, a fall in the price of tea? A fall in the price of tea decreases the demand for coffee, 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, with a lower equilibrium price and a lower equilibrium quantity. This illustrates another general principle: *When demand for a good decreases, the equilibrium price of the good and the equilibrium quantity both fall.*

Figure 3-12

Equilibrium and Shifts of the Demand Curve

The original equilibrium in the market for coffee is at E_1, at the intersection of the supply curve and the original demand curve D_1. A rise in the price of tea, a substitute, shifts the demand curve rightward to D_2. A shortage exists at the original price P_1, so both price and the quantity supplied 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 increases, the equilibrium price and the equilibrium quantity of the good both rise.*



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 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 really know are the *effects* of shifts of the supply curve.

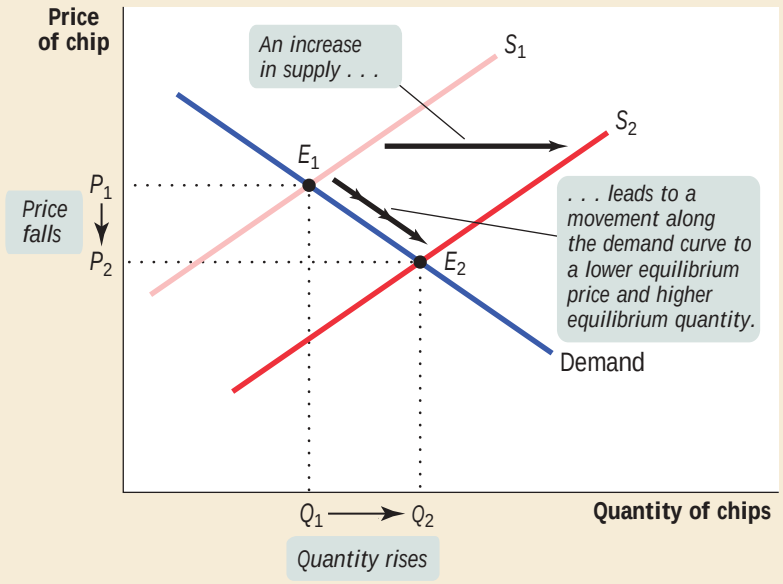
A spectacular example of a change in technology increasing supply occurred in the manufacture of semiconductors—the silicon chips that are the core of computers, video games, and many other devices. In the early 1970s, engineers learned how to use a process known as photolithography to put microscopic electronic components onto a silicon chip; subsequent progress in the technique has allowed ever more components to be put on each chip. Figure 3-13 (page 64) shows the effect of such an innovation on the market for silicon chips. The demand curve does not change. The original equilibrium is at E_1, the point of intersection of the original supply curve S_1 and the demand curve, with equilibrium price P_1 and equilibrium quantity Q_1. As a result of the technological change, supply increases and S_1 shifts rightward to S_2. At the original price P_1, a surplus of chips now exists and the market is no longer in equilibrium. The surplus causes a fall in price and a rise in quantity demanded, a downward 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 lower and the equilibrium quantity higher than before. This may be stated as a general principle: *An increase in supply leads to a fall in the equilibrium price and a rise in the equilibrium quantity.*

What happens to the market when supply decreases? A decrease in supply leads to a *leftward* shift of the supply curve. At the original price, a shortage now exists; as a result, the equilibrium price rises and the quantity demanded falls. This describes the sequence of events in the newspaper market in 1994–1995, which we

Figure 3-13

Equilibrium and Shifts of the Supply Curve

The original equilibrium in the market for silicon chips is at E_1, at the intersection of the demand curve and the original supply curve S_1. After a technological change increases the supply of silicon chips, the supply curve shifts rightward to S_2. A surplus exists at the original price P_1, so price falls and the quantity demanded rises, a movement along the demand curve. A new equilibrium is reached at E_2, with a lower equilibrium price P_2 and a higher equilibrium quantity Q_2. *When supply of a good increases, the equilibrium price of the good rises and the equilibrium quantity falls.*



discussed earlier: a decrease in the supply of newsprint led to a rise in the price and the closure of many newspapers. We can formulate a general principle: *A decrease in supply leads to a rise in the equilibrium price and a fall in the equilibrium quantity.*

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.*

PITFALLS

WHICH CURVE IS IT, ANYWAY?

When the price of some good changes, in general we can say that this reflects a change in either supply or demand. But it is easy to get confused about which one. A helpful clue is the direction of change in the quantity. If the quantity sold changes in the *same* direction as the price—for example, if both the price and the quantity rise—this suggests that the demand curve has shifted. If the price and the quantity move in *opposite* directions, the likely cause is a shift in the supply curve.

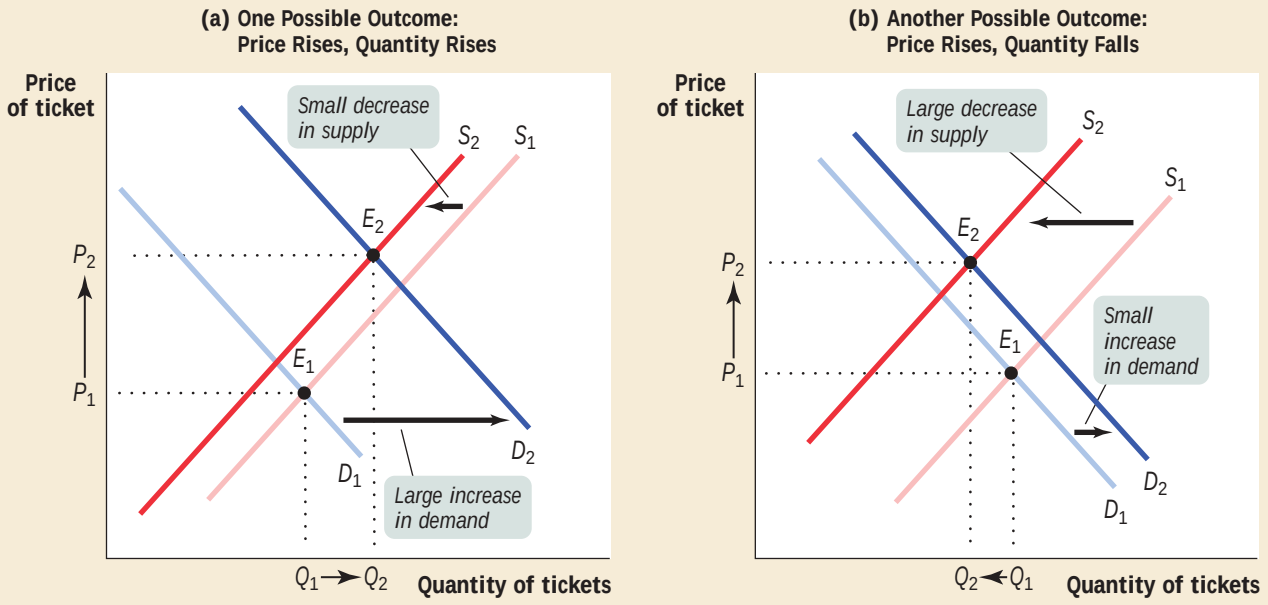
Simultaneous Shifts in Supply and Demand

Finally, it sometimes happens that events shift *both* the demand and supply curves. In fact, this chapter began with an example of such a simultaneous shift. Wayne Gretzky's announcement that he was retiring increased the demand for scalped tickets because more people wanted to see him play one last time; but it also decreased the supply because those who already had tickets became less willing to part with them.

Figure 3-14 illustrates what happened. In both panels we show an increase in demand—that is, a rightward shift of the demand curve, from D_1 to D_2. Notice that the rightward shift in panel (a) is relatively larger than the one in panel (b). Both panels also show a decrease in supply—that is, a leftward shift of the supply curve, from S_1 to S_2. Notice that the leftward shift in panel (b) is relatively larger than the one in panel (a).

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 scalped tickets 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

Figure 3-14 Simultaneous Shifts of the Demand and Supply Curves



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.

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

But suppose that the demand and supply curves shift in the same direction. 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 quantity increases but the change in price is ambiguous.
- When both demand and supply decrease, the quantity decreases but the change in price is ambiguous.

FOR INQUIRING MINDS

SUPPLY, DEMAND, AND CONTROLLED SUBSTANCES

The big "issue" movie of the year 2000 was *Traffic*, a panoramic treatment of the drug trade. The movie was loosely based on the 1989 British TV miniseries *Traffik*. Despite the lapse of 11 years, the basic outlines of the situation—in which the drug trade flourishes despite laws that are supposed to prevent it—had not changed. Not only has the so-called war on drugs by law enforcement officials not succeeded in eliminating the trade in illegal drugs; according to most assessments, it has not even done much to reduce consumption.

The failure of the war on drugs has a historical precedent: during Prohibition, from 1920 to 1933, the sale and consumption of alcohol was illegal in the United States. But liquor, produced and distributed by "bootleggers," nonetheless remained widely available. In fact, by 1929 per capita consumption of alcohol was higher than it had been a decade earlier. As with illegal drugs today, the production and distribution of the banned substance became a large enterprise that flourished despite its illegality.

Why is it so hard to choke off markets in alcohol and drugs? Think of the war on drugs as a policy that shifts the supply curve but has not done much to shift the demand curve.

Although it is illegal to use drugs such as cocaine, just as it was once illegal to drink alcohol, in practice the war on drugs focuses mainly on the suppliers. As a result, the cost of supplying drugs includes the risk of being caught and sent to jail, perhaps even of being executed. This undoubtedly reduces the quantity of drugs supplied *at any given price*, in effect shifting the supply curve for drugs to the left. In Figure 3-15, this is shown as a shift in the supply curve from S_1 to S_2. If the war on drugs had no effect on the price of drugs, this leftward shift would reflect a reduction in the quantity of drugs supplied equal in magnitude to the leftward shift of supply.

But as we have seen, when the supply curve for a good shifts to the left, the effect is to raise the market price of that good. In Figure 3-15 the effect of the war on drugs would be to move the equilibrium from E_1 to E_2, and to raise the price of drugs from P_1 to P_2, a movement along the demand curve. Because the market price rises, the actual decline in the quantity of drugs supplied is less than the decline in the quantity that would have been supplied at the original price.

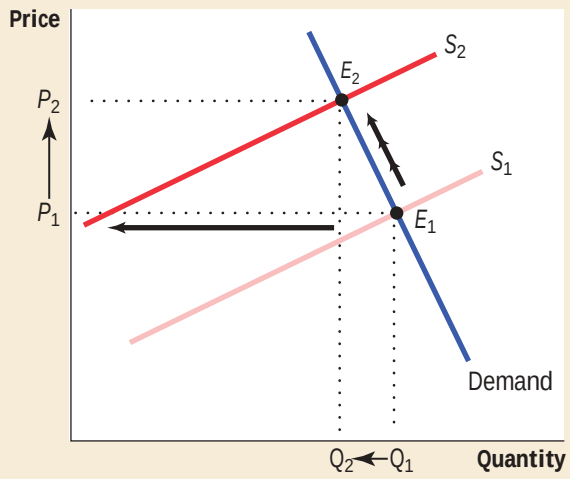
The crucial reason Prohibition was so ineffective was that as the market price of alcohol rose, consumers trimmed back only slightly on their consumption—yet the higher prices were enough to induce many potential suppliers to take the risk of jail time. So while Prohibition raised the price of alcohol, it did not do much to reduce consumption. Unfortunately, the same seems to be true of current drug policy. The policy raises the price of drugs to those who use them, but this does not do much to discourage consumption. Meanwhile, the higher prices are enough to induce suppliers to provide drugs despite the penalties.

What is the answer? Some argue that the policy should be refocused on the demand side—more antidrug education, more counseling, and so on. If these policies worked, they would shift demand to the left. Others argue that drugs, like alcohol, should be made legal but heavily taxed. While the debate goes on, so does the war on drugs.

Figure 3-15

Effects of the War on Drugs

The war on drugs shifts the supply curve to the left. However, we can see by comparing the original equilibrium E_1 with the new equilibrium E_2 that the actual reduction in the quantity of drugs supplied is much smaller than the shift of the supply curve. The equilibrium price has risen from P_1 to P_2—a movement along the demand curve. This leads suppliers to provide drugs despite the risks.



economics in action

Plain Vanilla Gets Fancy

Vanilla doesn't get any respect. It's such a common flavoring that "plain vanilla" has become a generic term for ordinary, unembellished products. But between 2000 and 2003, plain vanilla got quite fancy—at least if you looked at the price. At the

supermarket, the price of a small bottle of vanilla extract rose from about $5 to about $15. The wholesale price of vanilla beans rose 400 percent.

The cause of the price spike was bad weather—not here, but in the Indian Ocean. Most of the world's vanilla comes from Madagascar, an island nation off Africa's southeast coast. A huge cyclone struck there in 2000, and a combination of colder-than-normal weather and excessive rain impeded recovery.

The higher price of vanilla led to a fall in the quantity demanded: worldwide consumption of vanilla fell about 35 percent from 2000 to 2003. Consumers didn't stop eating vanilla-flavored products; instead, they switched (often without realizing it) to ice cream and other products flavored with synthetic vanillin, which is a by-product of wood pulp and petroleum production.

Notice that there was never a shortage of vanilla: you could always find it in the store if you were willing to pay the price. That is, the vanilla market remained in equilibrium. ■

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>>QUICK REVIEW

- Changes in the equilibrium price and quantity in a market result from shifts in the supply curve, the demand curve, or both.
- An increase in demand—a rightward shift of the demand curve—increases both the equilibrium price and the quantity bought. A decrease in demand—a leftward shift of the demand curve—pushes down both the equilibrium price and the quantity bought.
- An increase in supply drives the equilibrium price down but increases the equilibrium quantity. A decrease in supply raises the equilibrium price but reduces the equilibrium quantity.
- Often the fluctuations in markets involve shifts of both the supply and demand curves. When they shift in the same direction, the change in quantity is predictable but the change in price is not. When they move in opposite directions, the change in price is predictable but the change in quantity is not. When there are simultaneous shifts of the demand and supply curves, the curve that shifts the greater distance has a greater effect on the change in price and quantity.

>>CHECK YOUR UNDERSTANDING 3-4

1. In each of the following examples, determine (i) the market in question; (ii) whether a shift in demand or supply occurred, the direction of the shift, and what induced the shift; and (iii) the effect of the shift on the equilibrium price and the equilibrium quantity.
   a. As the price of gasoline fell in the United States during the 1990s, more people bought large cars.
   b. As technological innovation has lowered the cost of recycling used paper, fresh paper made from recycled stock is used more frequently.
   c. As a local cable company offers cheaper pay-per-view films, local movie theaters have more unfilled seats.
2. 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?

Solutions appear at back of book.

Competitive Markets—And Others

Early in this chapter, we defined a competitive market and explained that the supply and demand framework is a model of competitive markets. But we took a rain check on the question of why it matters whether or not a market is competitive. Now that we've seen how the supply and demand model works, we can offer some explanation.

To understand why competitive markets are different from other markets, compare the problems facing two individuals: a wheat farmer who must decide whether to grow more wheat, and the president of a giant aluminum company—say, Alcoa—who must decide whether to produce more aluminum.

For the wheat farmer, the question is simply whether the extra wheat can be sold at a price high enough to justify the extra production cost. The farmer need not worry about whether producing more wheat will affect the price of the wheat he or she was already planning to grow. That's because the wheat market is competitive. There are thousands of wheat farmers, and no one farmer's decision will have much impact on the market.

For the Alcoa executive, things are not that simple because the aluminum market is *not* competitive. There are only a few big players, including Alcoa, and each of them is well aware that its actions *do* have a noticeable impact on the market price. This adds a

whole new level of complexity to the decisions producers have to make. Alcoa can't decide whether or not to produce more aluminum just by asking whether the additional product will sell for more than it costs to make. The company also has to ask whether producing more aluminum will drive down the market price and reduce its profit.

When a market is competitive, individuals can base decisions on less complicated analyses than those used in a noncompetitive market. This in turn means that it's easier for economists to build a model of a competitive market than of a noncompetitive market.

Don't take this to mean that economic analysis has nothing to say about noncompetitive markets. On the contrary, economists can offer some very important insights into how other kinds of markets work. But those insights require other models. In the next chapter, we will focus on what we can learn about competitive markets from the very useful model we have just developed: supply and demand.

• A LOOK AHEAD •

We've now developed a model that explains how markets arrive at prices and why markets "work" in the sense that buyers can almost always find sellers, and vice versa. But this model could use a little more clarification.

But, nothing demonstrates a principle quite as well as what happens when people try to defy it. And governments do, fairly often, try to defy the principles of supply and demand. In the next chapter we consider what happens when they do—the revenge of the market.

SUMMARY

1. The **supply and demand model** illustrates how a **competitive market**, one with many buyers and sellers, 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.
3. A **movement along the demand curve** occurs when the price changes and causes a change in the quantity demanded. When economists talk of increasing or decreasing 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 four 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
5. The **supply schedule** shows the **quantity supplied** at each price and is represented graphically by a **supply curve**. Supply curves usually slope upward.
6. A **movement along the supply curve** occurs when the price changes and causes a change in the quantity supplied. When economists talk of increasing or decreasing 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 three main factors that shift the supply curve:
   - A change in **input** prices
   - A change in technology
   - A change in expectations
8. 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.

KEY TERMS

Competitive market, p. 47
Supply and demand model, p. 47
Demand schedule, p. 48
Demand curve, p. 48
Quantity demanded, p. 48
Law of demand, p. 49
Shift of the demand curve, p. 50
Movement along the demand curve, p. 50
Substitutes, p. 51
Complements, p. 51
Normal good, p. 52
Inferior good, p. 52
Quantity supplied, p. 53
Supply schedule, p. 53
Supply curve, p. 54
Shift of the supply curve, p. 54
Movement along the supply curve, p. 55
Input, p. 56
Equilibrium price, p. 58
Equilibrium quantity, p. 58
Market-clearing price, p. 58
Surplus, p. 60
Shortage, p. 60

PROBLEMS

1. A survey indicated that chocolate ice cream is America's favorite ice-cream flavor. For each of the following, indicate the possible effects on demand and/or supply and equilibrium price and quantity of chocolate ice cream.

a. A severe drought in the Midwest causes dairy farmers to reduce the number of milk-producing cattle in their herds by a third. These dairy farmers supply cream that is used to manufacture chocolate ice cream.

b. A new report by the American Medical Association reveals that chocolate does, in fact, have significant health benefits.

c. The discovery of cheaper synthetic vanilla flavoring lowers the price of vanilla ice cream.

d. New technology for mixing and freezing ice cream lowers manufacturers' costs of producing chocolate ice cream.

2. In a supply and demand diagram, draw the shift in demand for hamburgers in your hometown due to the following events. In each case show the effect on equilibrium price and quantity.

a. The price of tacos increases.

b. All hamburger sellers raise the price of their french fries.

c. Income falls in town. Assume that hamburgers are a normal good for most people.

d. Income falls in town. Assume that hamburgers are an inferior good for most people.

e. Hot dog stands cut the price of hot dogs.

3. The market for many goods changes in predictable ways according to the time of year, in response to events such as holidays, vacation times, seasonal changes in production, and so on. Using supply and demand, explain the change in price in each of the following cases. Note that supply and demand may shift simultaneously.

a. Lobster prices usually fall during the summer peak harvest season, despite the fact that people like to eat lobster during the summer months more than during any other time of year.

b. The price of a Christmas tree is lower after Christmas than before, despite the fact that tree growers harvest and supply fewer trees for sale after Christmas than before.

c. The price of a round-trip ticket to Paris on Air France falls by more than $200 after the end of school vacation in September. This happens despite the fact that generally worsening weather increases the cost of operating flights to Paris, and Air France therefore reduces the number of flights to Paris at any given price.

4. Show in a diagram the effect on the demand curve, the supply curve, the equilibrium price, and the equilibrium quantity of each of the following events.

a. The market for newspapers in your town.
Case 1: The salaries of journalists go up.
Case 2: There is a big news event in your town, which is reported in the newspapers.

b. The market for St. Louis Rams cotton T-shirts.
Case 1: The Rams win the national championship.
Case 2: The price of cotton increases.

c. The market for bagels.
Case 1: People realize how fattening they are.
Case 2: People have less time to make themselves a cooked breakfast.

d. The market for the Krugman and Wells economics textbook.
Case 1: Your professor makes it required reading for all of his or her students.
Case 2: Printing costs for textbooks are lowered by the use of synthetic paper.

5. Suppose that the supply schedule of Maine lobsters is as follows:

Price of lobster (per pound)	Quantity of lobster supplied (pounds)
$25	800
20	700
15	600
10	500
5	400

Suppose that Maine lobsters can be sold only in the United States. The U.S. demand schedule for Maine lobsters is as follows:

Price of lobster (per pound)	Quantity of lobster demanded (pounds)
$25	200
20	400
15	600
10	800
5	1,000

a. Draw the demand curve and the supply curve for Maine lobsters. What is the equilibrium price and quantity of lobsters?

Now suppose that Maine lobsters can be sold in France. The French demand schedule for Maine lobsters is as follows:

Price of lobster (per pound)	Quantity of lobster demanded (pounds)
$25	100
20	300
15	500
10	700
5	900

b. What is the demand schedule for Maine lobsters now that French consumers can also buy them? Draw a supply and demand diagram that illustrates the new equilibrium price and quantity of lobsters. What will happen to the price at which fishermen can sell lobster? What will happen to the price paid by U.S. consumers? What will happen to the quantity consumed by U.S. consumers?

6. Find the flaws in reasoning in the following statements, paying particular attention to the distinction between shifts of and movements along the supply and demand curves. Draw a diagram to illustrate what actually happens in each situation.

a. "A technological innovation that lowers the cost of producing a good might seem at first to result in a reduction in the price of the good to consumers. But a fall in price will increase demand for the good, and higher demand will send the price up again. It is not certain, therefore, that an innovation will really reduce price in the end."

b. "A study shows that eating a clove of garlic a day can help prevent heart disease, causing many consumers to demand more garlic. This increase in demand results in a rise in the price of garlic. Consumers, seeing that the price of garlic has gone up, reduce their demand for garlic. This causes the demand for garlic to decrease and the price of garlic to fall. Therefore, the ultimate effect of the study on the price of garlic is uncertain."

7. Some points on a demand curve for a normal good are given here:

Price	Quantity demanded
$23	70
21	90
19	110
17	130

Do you think that the increase in quantity demanded (from 90 to 110 in the table) when price decreases (from 21 to 19) is due to a rise in consumers' income? Explain clearly (and briefly) why or why not.

8. Aaron Hank is a star hitter for the Bay City baseball team. He is close to breaking the major league record for home runs hit during one season, and it is widely anticipated that in the next game he will break that record. As a result, tickets for the team's next game have been a hot commodity. But today it is announced that, due to a knee injury, he will not in fact play in the team's next game. Assume that season ticket-holders are able to resell their tickets if they wish. Use supply and demand diagrams to explain the following.

a. Show the case in which this announcement results in a lower equilibrium price and a lower equilibrium quantity than before the announcement.

b. Show the case in which this announcement results in a lower equilibrium price and a higher equilibrium quantity than before the announcement.

c. What accounts for whether case a or case b occurs?

d. Suppose that a scalper had secretly learned before the announcement that Aaron Hank would not play in the next game. What actions do you think he would take?

9. In *Rolling Stone* magazine, several fans and rock stars, including Pearl Jam, were bemoaning the high price of concert tickets. One superstar argued, "It just isn't worth $75 to see me play. No one should have to pay that much to go to a concert." Assume this star sold out arenas around the country at an average ticket price of $75.

a. How would you evaluate the arguments that ticket prices are too high?

b. Suppose that due to this star's protests, ticket prices were lowered to $50. In what sense is this price too low? Draw a diagram using supply and demand curves to support your argument.

c. Suppose Pearl Jam really wanted to bring down ticket prices. Since the band controls the supply of its services, what do you recommend they do? Explain using a supply and demand diagram.

d. Suppose the band's next CD was a total dud. Do you think they would still have to worry about ticket prices being too high? Why or why not? Draw a supply and demand diagram to support your argument.

e. Suppose the group announced their next tour was going to be their last. What effect would this likely have on the demand for and price of tickets? Illustrate with a supply and demand diagram.

10. The accompanying table gives the annual U.S. demand and supply schedules for pickup trucks.

Price of truck	Quantity of trucks demanded (millions)	Quantity of trucks supplied (millions)
$20,000	20	14
25,000	18	15
30,000	16	16
35,000	14	17
40,000	12	18

a. Plot the demand and supply curves using these schedules. Indicate the equilibrium price and quantity on your diagram.

b. Suppose the tires used on pickup trucks are found to be defective. What would you expect to happen in the market for pickup trucks? Show this on your diagram.

c. Suppose that the U.S. Department of Transportation imposes restrictions on manufacturers that cause them to reduce supply by one-third at any given price. Calculate and plot the new supply schedule and indicate the new equilibrium price and quantity on your diagram.

11. After several years of decline, the market for handmade acoustic guitars is making a comeback. These guitars are usually made in small workshops employing relatively few highly skilled luthiers. Assess the impact on the equilibrium price and quantity of handmade acoustic guitars as a result of each of the following events. In your answers indicate which curve(s) shift(s) and in which direction.

a. Environmentalists succeed in having the use of Brazilian rosewood banned in the United States, forcing luthiers to seek out alternative, more costly woods.

b. A foreign producer reengineers the guitar-making process and floods the market with identical guitars.

c. Music featuring handmade acoustic guitars makes a comeback as audiences tire of heavy metal and grunge music.

d. The country goes into a deep recession and the income of the average American falls sharply.

12. *Demand twisters*: Sketch and explain the demand relationship in each of the following statements.

a. I would never buy a Britney Spears CD! You couldn't even give me one for nothing.

b. I generally buy a bit more coffee as the price falls. But once the price falls to $2 per pound, I'll buy out the entire stock of the supermarket.

c. I spend more on orange juice even as the price rises. (Does this mean that I must be violating the law of demand?)

d. The price of meals in my dormitory cafeteria has risen. But since I quit my part-time job, I now eat more meals there than at restaurants. (This one requires that you draw both the demand and the supply curves for dormitory cafeteria meals.) Assume that the demand curve slopes downward, and the supply curve slopes upward.

13. Will Shakespeare is a struggling playwright in sixteenth-century London. As the price he receives for writing a play increases, he is willing to write more plays. For the following situations, use a diagram to illustrate how each event affects the equilibrium price and quantity in the market for Shakespeare's plays.

a. The playwright Christopher Marlowe, Shakespeare's chief rival, is killed in a bar brawl.

b. The bubonic plague, a deadly infectious disease, breaks out in London.

c. To celebrate the defeat of the Spanish Armada, Queen Elizabeth declares several weeks of festivities, which involves commissioning new plays.

14. The small town of Middling experiences a sudden doubling of the birth rate. After three years, the birth rate returns to normal. Use a diagram to illustrate the effect of these events on the following.

a. The market for an hour of babysitting services in Middling today

b. The market for an hour of babysitting services 14 years into the future, after the birth rate has returned to normal, by which time children born today are old enough to work as babysitters.

c. The market for an hour of babysitting services 30 years into the future, when children born today are likely to be having children of their own.

15. Use a diagram to illustrate how each of the following events affects the equilibrium price and quantity of pizza.

a. The price of mozzarella cheese rises.

b. The health hazards of hamburgers are widely publicized.

c. The price of tomato sauce falls.

d. The incomes of consumers rise and pizza is an inferior good.

e. Consumers expect the price of pizza to fall next week.

16. Although he was a prolific artist, Pablo Picasso painted only 1,000 canvases during his "Blue Period." Picasso is now dead, and all of his Blue Period works are currently on display in museums and private galleries throughout Europe and the United States.

a. Draw a supply curve for Picasso Blue Period works. Why is this supply curve different from ones you have seen?

b. Given the supply curve from part a, the price of a Picasso Blue Period work will be entirely dependent on what factor(s)? Draw a diagram showing how the equilibrium price of such a work is determined.

c. Suppose that rich art collectors decide that it is essential to acquire Picasso Blue Period art for their collections. Show the impact of this on the market for these paintings.

17. Draw the appropriate curve in each of the following cases. Is it like or unlike the curves you have seen so far? Explain.

a. The demand for cardiac bypass surgery, given that the government pays the full cost for any patient

b. The demand for elective cosmetic plastic surgery, given that the patient pays the full cost

c. The supply of Rembrandt paintings

d. The supply of reproductions of Rembrandt paintings