

4



THE MARKET FORCES OF SUPPLY AND DEMAND

When a cold snap hits Florida, the price of orange juice rises in supermarkets throughout the country. When the weather turns warm in New England every summer, the price of hotel rooms in the Caribbean plummets. When a war breaks out in the Middle East, the price of gasoline in the United States rises, and the price of a used Cadillac falls. What do these events have in common? They all show the workings of supply and demand.

Supply and *demand* are the two words that economists use most often—and for good reason. Supply and demand are the forces that make market economies work. They determine the quantity of each good produced and the price at which it is sold. If you want to know how any event or policy will affect the economy, you must think first about how it will affect supply and demand.

This chapter introduces the theory of supply and demand. It considers how buyers and sellers behave and how they interact with one another. It shows how

IN THIS CHAPTER
YOU WILL . . .

Learn the nature of a competitive market

Examine what determines the demand for a good in a competitive market

Examine what determines the supply of a good in a competitive market

See how supply and demand together set the price of a good and the quantity sold

Consider the key role of prices in allocating scarce resources in market economies

supply and demand determine prices in a market economy and how prices, in turn, allocate the economy's scarce resources.

MARKETS AND COMPETITION

market

a group of buyers and sellers of a particular good or service

The terms *supply* and *demand* refer to the behavior of people as they interact with one another in markets. A **market** is a group of buyers and sellers of a particular good or service. The buyers as a group determine the demand for the product, and the sellers as a group determine the supply of the product. Before discussing how buyers and sellers behave, let's first consider more fully what we mean by a "market" and the various types of markets we observe in the economy.

COMPETITIVE MARKETS

Markets take many forms. Sometimes markets are highly organized, such as the markets for many agricultural commodities. In these markets, buyers and sellers meet at a specific time and place, where an auctioneer helps set prices and arrange sales.

More often, markets are less organized. For example, consider the market for ice cream in a particular town. Buyers of ice cream do not meet together at any one time. The sellers of ice cream are in different locations and offer somewhat different products. There is no auctioneer calling out the price of ice cream. Each seller posts a price for an ice-cream cone, and each buyer decides how much ice cream to buy at each store.

Even though it is not organized, the group of ice-cream buyers and ice-cream sellers forms a market. Each buyer knows that there are several sellers from which to choose, and each seller is aware that his product is similar to that offered by other sellers. The price of ice cream and the quantity of ice cream sold are not determined by any single buyer or seller. Rather, price and quantity are determined by all buyers and sellers as they interact in the marketplace.

The market for ice cream, like most markets in the economy, is highly competitive. A **competitive market** is a market in which there are many buyers and many sellers so that each has a negligible impact on the market price. Each seller of ice cream has limited control over the price because other sellers are offering similar products. A seller has little reason to charge less than the going price, and if he or she charges more, buyers will make their purchases elsewhere. Similarly, no single buyer of ice cream can influence the price of ice cream because each buyer purchases only a small amount.

In this chapter we examine how buyers and sellers interact in competitive markets. We see how the forces of supply and demand determine both the quantity of the good sold and its price.

COMPETITION: PERFECT AND OTHERWISE

We assume in this chapter that markets are *perfectly competitive*. Perfectly competitive markets are defined by two primary characteristics: (1) the goods being offered for sale are all the same, and (2) the buyers and sellers are so numerous that

competitive market

a market in which there are many buyers and many sellers so that each has a negligible impact on the market price

no single buyer or seller can influence the market price. Because buyers and sellers in perfectly competitive markets must accept the price the market determines, they are said to be *price takers*.

There are some markets in which the assumption of perfect competition applies perfectly. In the wheat market, for example, there are thousands of farmers who sell wheat and millions of consumers who use wheat and wheat products. Because no single buyer or seller can influence the price of wheat, each takes the price as given.

Not all goods and services, however, are sold in perfectly competitive markets. Some markets have only one seller, and this seller sets the price. Such a seller is called a *monopoly*. Your local cable television company, for instance, may be a monopoly. Residents of your town probably have only one cable company from which to buy this service.

Some markets fall between the extremes of perfect competition and monopoly. One such market, called an *oligopoly*, has a few sellers that do not always compete aggressively. Airline routes are an example. If a route between two cities is serviced by only two or three carriers, the carriers may avoid rigorous competition to keep prices high. Another type of market is *monopolistically competitive*; it contains many sellers, each offering a slightly different product. Because the products are not exactly the same, each seller has some ability to set the price for its own product. An example is the software industry. Many word processing programs compete with one another for users, but every program is different from every other and has its own price.

Despite the diversity of market types we find in the world, we begin by studying perfect competition. Perfectly competitive markets are the easiest to analyze. Moreover, because some degree of competition is present in most markets, many of the lessons that we learn by studying supply and demand under perfect competition apply in more complicated markets as well.

QUICK QUIZ: What is a market? ♦ What does it mean for a market to be competitive?

DEMAND

We begin our study of markets by examining the behavior of buyers. Here we consider what determines the **quantity demanded** of any good, which is the amount of the good that buyers are willing and able to purchase. To focus our thinking, let's keep in mind a particular good—ice cream.

quantity demanded

the amount of a good that buyers are willing and able to purchase

WHAT DETERMINES THE QUANTITY AN INDIVIDUAL DEMANDS?

Consider your own demand for ice cream. How do you decide how much ice cream to buy each month, and what factors affect your decision? Here are some of the answers you might give.

law of demand

the claim that, other things equal, the quantity demanded of a good falls when the price of the good rises

normal good

a good for which, other things equal, an increase in income leads to an increase in demand

inferior good

a good for which, other things equal, an increase in income leads to a decrease in demand

substitutes

two goods for which an increase in the price of one leads to an increase in the demand for the other

complements

two goods for which an increase in the price of one leads to a decrease in the demand for the other

Price If the price of ice cream rose to \$20 per scoop, you would buy less ice cream. You might buy frozen yogurt instead. If the price of ice cream fell to \$0.20 per scoop, you would buy more. Because the quantity demanded falls as the price rises and rises as the price falls, we say that the quantity demanded is *negatively related* to the price. This relationship between price and quantity demanded is true for most goods in the economy and, in fact, is so pervasive that economists call it the **law of demand**: Other things equal, when the price of a good rises, the quantity demanded of the good falls.

Income What would happen to your demand for ice cream if you lost your job one summer? Most likely, it would fall. A lower income means that you have less to spend in total, so you would have to spend less on some—and probably most—goods. If the demand for a good falls when income falls, the good is called a **normal good**.

Not all goods are normal goods. If the demand for a good rises when income falls, the good is called an **inferior good**. An example of an inferior good might be bus rides. As your income falls, you are less likely to buy a car or take a cab, and more likely to ride the bus.

Prices of Related Goods Suppose that the price of frozen yogurt falls. The law of demand says that you will buy more frozen yogurt. At the same time, you will probably buy less ice cream. Because ice cream and frozen yogurt are both cold, sweet, creamy desserts, they satisfy similar desires. When a fall in the price of one good reduces the demand for another good, the two goods are called **substitutes**. Substitutes are often pairs of goods that are used in place of each other, such as hot dogs and hamburgers, sweaters and sweatshirts, and movie tickets and video rentals.

Now suppose that the price of hot fudge falls. According to the law of demand, you will buy more hot fudge. Yet, in this case, you will buy *more* ice cream as well, because ice cream and hot fudge are often used together. When a fall in the price of one good raises the demand for another good, the two goods are called **complements**. Complements are often pairs of goods that are used together, such as gasoline and automobiles, computers and software, and skis and ski lift tickets.

Tastes The most obvious determinant of your demand is your tastes. If you like ice cream, you buy more of it. Economists normally do not try to explain people's tastes because tastes are based on historical and psychological forces that are beyond the realm of economics. Economists do, however, examine what happens when tastes change.

Expectations Your expectations about the future may affect your demand for a good or service today. For example, if you expect to earn a higher income next month, you may be more willing to spend some of your current savings buying ice cream. As another example, if you expect the price of ice cream to fall tomorrow, you may be less willing to buy an ice-cream cone at today's price.

THE DEMAND SCHEDULE AND THE DEMAND CURVE

We have seen that many variables determine the quantity of ice cream a person demands. Imagine that we hold all these variables constant except one—the price. Let’s consider how the price affects the quantity of ice cream demanded.

Table 4-1 shows how many ice-cream cones Catherine buys each month at different prices of ice cream. If ice cream is free, Catherine eats 12 cones. At \$0.50 per cone, Catherine buys 10 cones. As the price rises further, she buys fewer and fewer cones. When the price reaches \$3.00, Catherine doesn’t buy any ice cream at all. Table 4-1 is a **demand schedule**, a table that shows the relationship between the price of a good and the quantity demanded. (Economists use the term *schedule* because the table, with its parallel columns of numbers, resembles a train schedule.)

Figure 4-1 graphs the numbers in Table 4-1. By convention, the price of ice cream is on the vertical axis, and the quantity of ice cream demanded is on the

demand schedule

a table that shows the relationship between the price of a good and the quantity demanded

Table 4-1

CATHERINE’S DEMAND SCHEDULE. The demand schedule shows the quantity demanded at each price.

PRICE OF ICE-CREAM CONE	QUANTITY OF CONES DEMANDED
\$0.00	12
0.50	10
1.00	8
1.50	6
2.00	4
2.50	2
3.00	0

Figure 4-1

CATHERINE’S DEMAND CURVE. This demand curve, which graphs the demand schedule in Table 4-1, shows how the quantity demanded of the good changes as its price varies. Because a lower price increases the quantity demanded, the demand curve slopes downward.



demand curve

a graph of the relationship between the price of a good and the quantity demanded

ceteris paribus

a Latin phrase, translated as “other things being equal,” used as a reminder that all variables other than the ones being studied are assumed to be constant

horizontal axis. The downward-sloping line relating price and quantity demanded is called the **demand curve**.

CETERIS PARIBUS

Whenever you see a demand curve, remember that it is drawn holding many things constant. Catherine’s demand curve in Figure 4-1 shows what happens to the quantity of ice cream Catherine demands when only the price of ice cream varies. The curve is drawn assuming that Catherine’s income, tastes, expectations, and the prices of related products are not changing.

Economists use the term *ceteris paribus* to signify that all the relevant variables, except those being studied at that moment, are held constant. The Latin phrase literally means “other things being equal.” The demand curve slopes downward because, *ceteris paribus*, lower prices mean a greater quantity demanded.

Although the term *ceteris paribus* refers to a hypothetical situation in which some variables are assumed to be constant, in the real world many things change at the same time. For this reason, when we use the tools of supply and demand to analyze events or policies, it is important to keep in mind what is being held constant and what is not.

MARKET DEMAND VERSUS INDIVIDUAL DEMAND

So far we have talked about an individual’s demand for a product. To analyze how markets work, we need to determine the *market demand*, which is the sum of all the individual demands for a particular good or service.

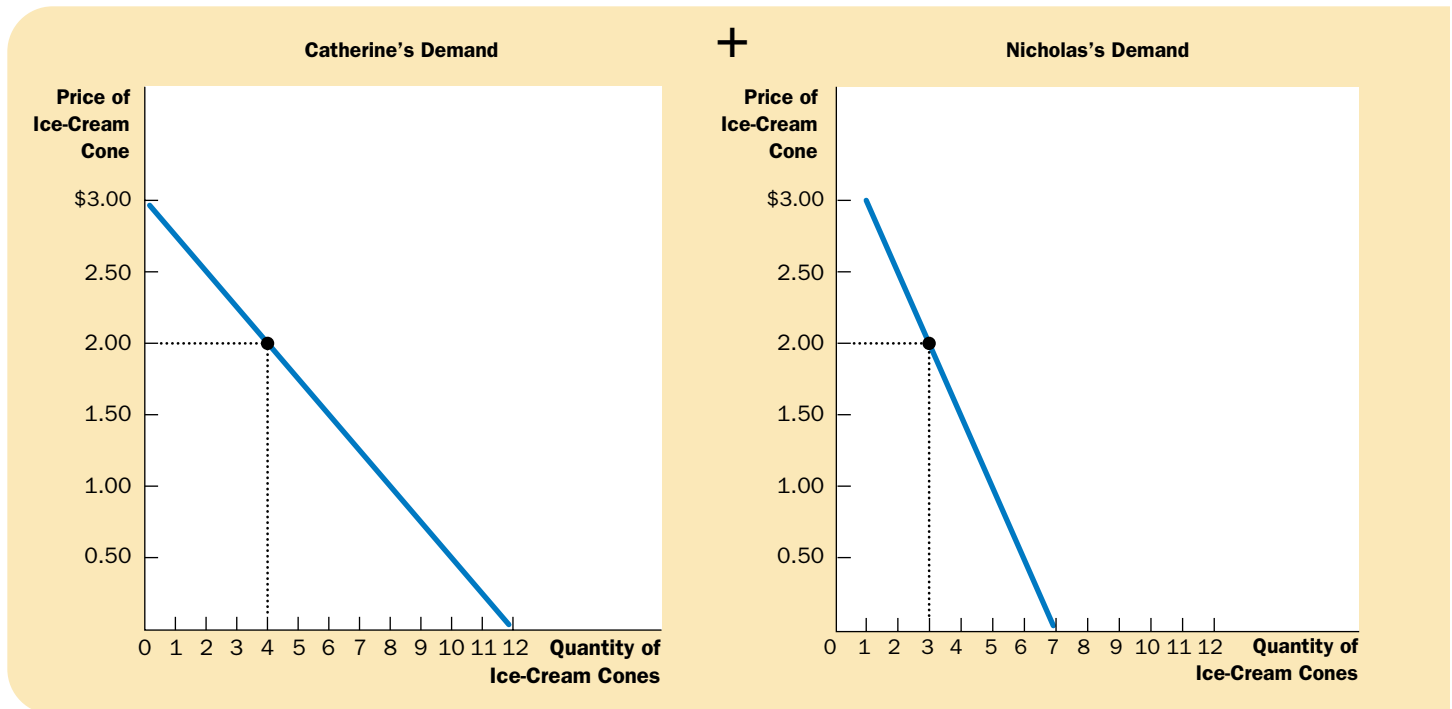


Table 4-2 shows the demand schedules for ice cream of two individuals—Catherine and Nicholas. At any price, Catherine’s demand schedule tells us how much ice cream she buys, and Nicholas’s demand schedule tells us how much ice cream he buys. The market demand is the sum of the two individual demands.

Because market demand is derived from individual demands, it depends on all those factors that determine the demand of individual buyers. Thus, market demand depends on buyers’ incomes, tastes, expectations, and the prices of related goods. It also depends on the number of buyers. (If Peter, another consumer of ice cream, were to join Catherine and Nicholas, the quantity demanded in the market would be higher at every price.) The demand schedules in Table 4-2 show what happens to quantity demanded as the price varies while all the other variables that determine quantity demanded are held constant.

Figure 4-2 shows the demand curves that correspond to these demand schedules. Notice that we sum the individual demand curves *horizontally* to obtain the

PRICE OF ICE-CREAM CONE	CATHERINE		NICHOLAS		MARKET
\$0.00	12	+	7	=	19
0.50	10		6		16
1.00	8		5		13
1.50	6		4		10
2.00	4		3		7
2.50	2		2		4
3.00	0		1		1

Table 4-2

INDIVIDUAL AND MARKET DEMAND SCHEDULES. The quantity demanded in a market is the sum of the quantities demanded by all the buyers.

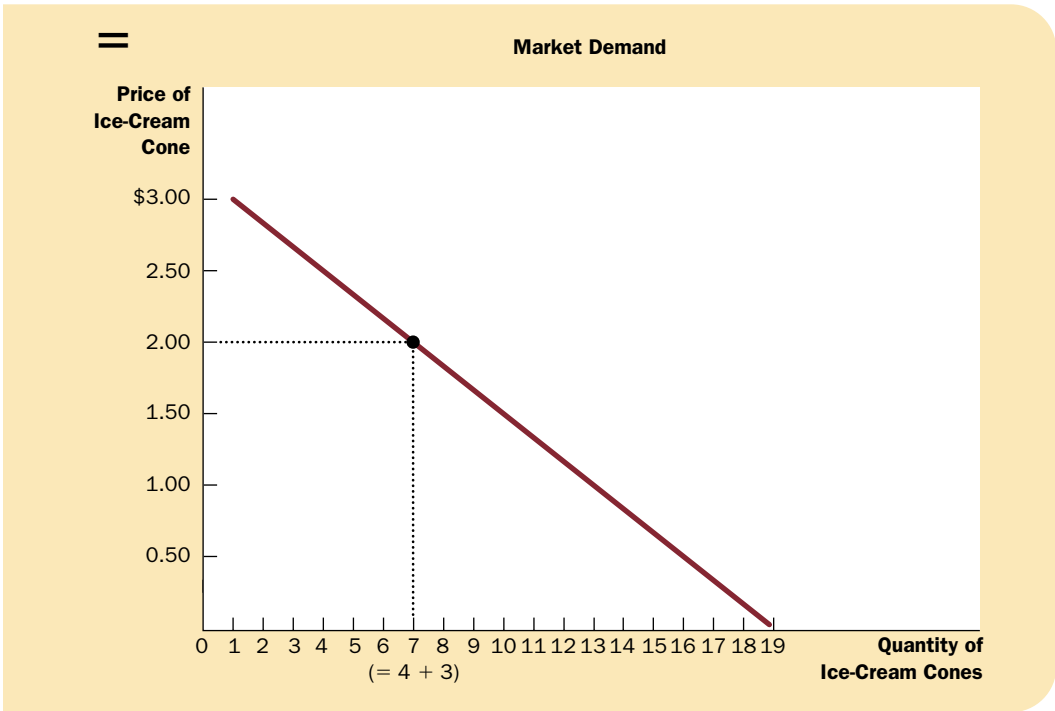


Figure 4-2

MARKET DEMAND AS THE SUM OF INDIVIDUAL DEMANDS. The market demand curve is found by adding horizontally the individual demand curves. At a price of \$2, Catherine demands 4 ice-cream cones, and Nicholas demands 3 ice-cream cones. The quantity demanded in the market at this price is 7 cones.

market demand curve. That is, to find the total quantity demanded at any price, we add the individual quantities found on the horizontal axis of the individual demand curves. Because we are interested in analyzing how markets work, we will work most often with the market demand curve. The market demand curve shows how the total quantity demanded of a good varies as the price of the good varies.

SHIFTS IN THE DEMAND CURVE

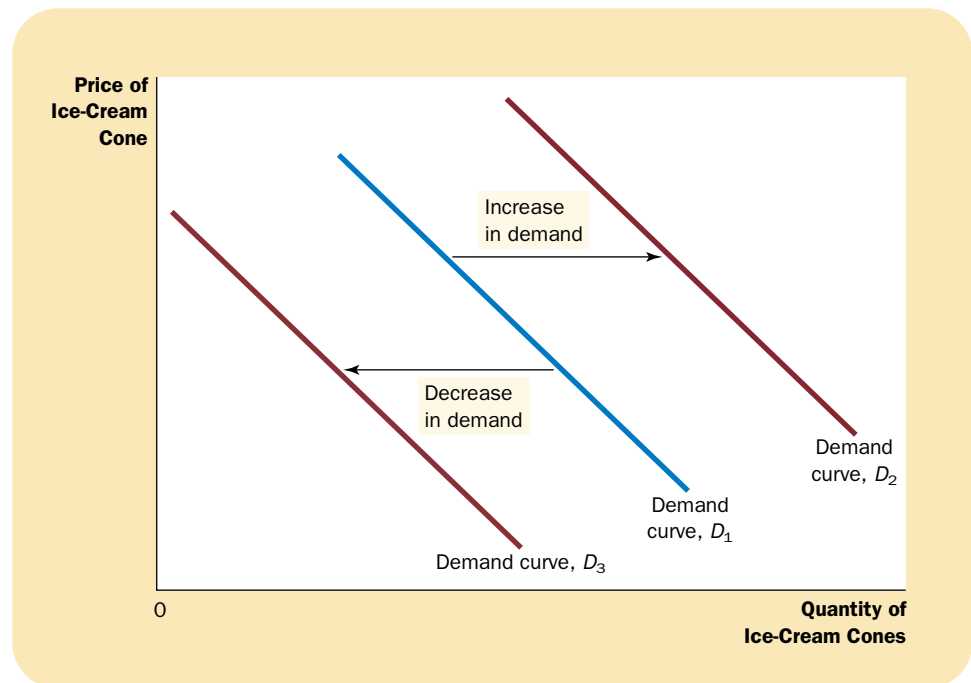
Suppose that the American Medical Association suddenly announces a new discovery: People who regularly eat ice cream live longer, healthier lives. How does this announcement affect the market for ice cream? The discovery changes people's tastes and raises the demand for ice cream. At any given price, buyers now want to purchase a larger quantity of ice cream, and the demand curve for ice cream shifts to the right.

Whenever any determinant of demand changes, other than the good's price, the demand curve shifts. As Figure 4-3 shows, any change that increases the quantity demanded at every price shifts the demand curve to the right. Similarly, any change that reduces the quantity demanded at every price shifts the demand curve to the left.

Table 4-3 lists the variables that determine the quantity demanded in a market and how a change in the variable affects the demand curve. Notice that price plays a special role in this table. Because price is on the vertical axis when we graph a demand curve, a change in price does not shift the curve but represents a movement along it. By contrast, when there is a change in income, the prices of related goods, tastes, expectations, or the number of buyers, the quantity demanded at each price changes; this is represented by a shift in the demand curve.

Figure 4-3

SHIFTS IN THE DEMAND CURVE. Any change that raises the quantity that buyers wish to purchase at a given price shifts the demand curve to the right. Any change that lowers the quantity that buyers wish to purchase at a given price shifts the demand curve to the left.



VARIABLES THAT AFFECT QUANTITY DEMANDED	A CHANGE IN THIS VARIABLE . . .
Price	Represents a movement along the demand curve
Income	Shifts the demand curve
Prices of related goods	Shifts the demand curve
Tastes	Shifts the demand curve
Expectations	Shifts the demand curve
Number of buyers	Shifts the demand curve

Table 4-3

THE DETERMINANTS OF QUANTITY DEMANDED. This table lists the variables that can influence the quantity demanded in a market. Notice the special role that price plays: A change in the price represents a movement along the demand curve, whereas a change in one of the other variables shifts the demand curve.

In summary, *the demand curve shows what happens to the quantity demanded of a good when its price varies, holding constant all other determinants of quantity demanded. When one of these other determinants changes, the demand curve shifts.*

CASE STUDY TWO WAYS TO REDUCE THE QUANTITY OF SMOKING DEMANDED

Public policymakers often want to reduce the amount that people smoke. There are two ways that policy can attempt to achieve this goal.

One way to reduce smoking is to shift the demand curve for cigarettes and other tobacco products. Public service announcements, mandatory health warnings on cigarette packages, and the prohibition of cigarette advertising on television are all policies aimed at reducing the quantity of cigarettes demanded at any given price. If successful, these policies shift the demand curve for cigarettes to the left, as in panel (a) of Figure 4-4.

Alternatively, policymakers can try to raise the price of cigarettes. If the government taxes the manufacture of cigarettes, for example, cigarette companies pass much of this tax on to consumers in the form of higher prices. A higher price encourages smokers to reduce the numbers of cigarettes they smoke. In this case, the reduced amount of smoking does not represent a shift in the demand curve. Instead, it represents a movement along the same demand curve to a point with a higher price and lower quantity, as in panel (b) of Figure 4-4.

How much does the amount of smoking respond to changes in the price of cigarettes? Economists have attempted to answer this question by studying what happens when the tax on cigarettes changes. They have found that a 10 percent increase in the price causes a 4 percent reduction in the quantity demanded. Teenagers are found to be especially sensitive to the price of cigarettes: A 10 percent increase in the price causes a 12 percent drop in teenage smoking.

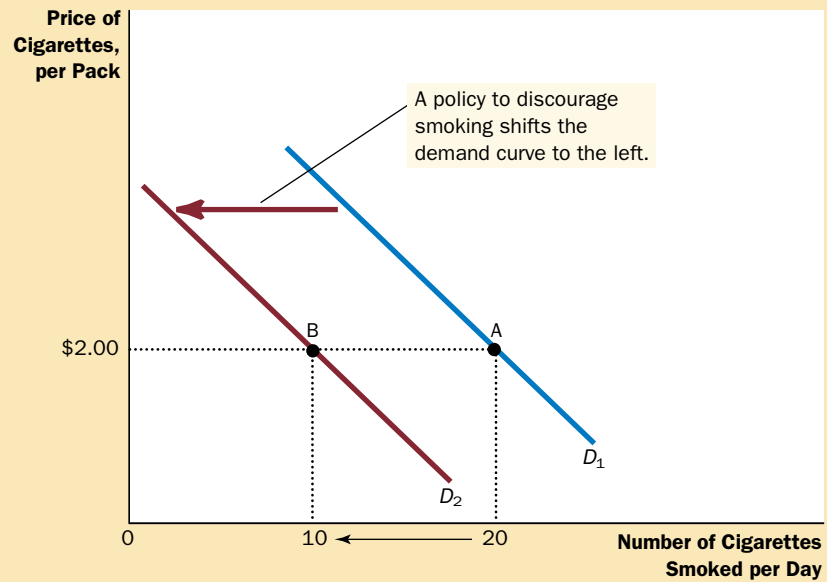
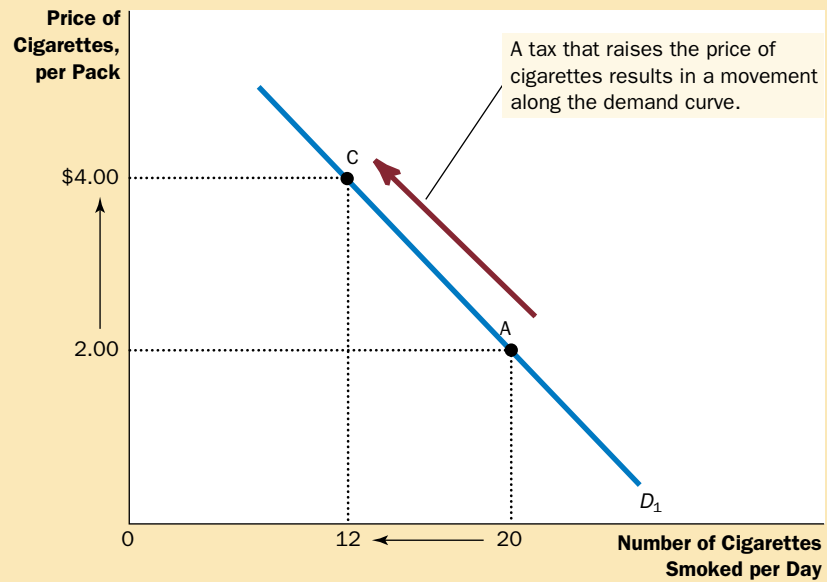
A related question is how the price of cigarettes affects the demand for illicit drugs, such as marijuana. Opponents of cigarette taxes often argue that tobacco and marijuana are substitutes, so that high cigarette prices encourage marijuana use. By contrast, many experts on substance abuse view tobacco as a “gateway drug” leading the young to experiment with other harmful substances. Most studies of the data are consistent with this view: They find that lower cigarette prices are associated with greater use of marijuana. In other words, tobacco and marijuana appear to be complements rather than substitutes.



WHAT IS THE BEST WAY TO STOP THIS?

Figure 4-4

SHIFTS IN THE DEMAND CURVE VERSUS MOVEMENTS ALONG THE DEMAND CURVE. If warnings on cigarette packages convince smokers to smoke less, the demand curve for cigarettes shifts to the left. In panel (a), the demand curve shifts from D_1 to D_2 . At a price of \$2 per pack, the quantity demanded falls from 20 to 10 cigarettes per day, as reflected by the shift from point A to point B. By contrast, if a tax raises the price of cigarettes, the demand curve does not shift. Instead, we observe a movement to a different point on the demand curve. In panel (b), when the price rises from \$2 to \$4, the quantity demanded falls from 20 to 12 cigarettes per day, as reflected by the movement from point A to point C.

(a) A Shift in the Demand Curve**(b) A Movement along the Demand Curve**

QUICK QUIZ: List the determinants of the quantity of pizza you demand.
 ◆ Make up an example of a demand schedule for pizza, and graph the implied demand curve. ◆ Give an example of something that would shift this demand curve. ◆ Would a change in the price of pizza shift this demand curve?

SUPPLY

We now turn to the other side of the market and examine the behavior of sellers. The **quantity supplied** of any good or service is the amount that sellers are willing and able to sell. Once again, to focus our thinking, let's consider the market for ice cream and look at the factors that determine the quantity supplied.

quantity supplied

the amount of a good that sellers are willing and able to sell

WHAT DETERMINES THE QUANTITY AN INDIVIDUAL SUPPLIES?

Imagine that you are running Student Sweets, a company that produces and sells ice cream. What determines the quantity of ice cream you are willing to produce and offer for sale? Here are some possible answers.

Price The price of ice cream is one determinant of the quantity supplied. When the price of ice cream is high, selling ice cream is profitable, and so the quantity supplied is large. As a seller of ice cream, you work long hours, buy many ice-cream machines, and hire many workers. By contrast, when the price of ice cream is low, your business is less profitable, and so you will produce less ice cream. At an even lower price, you may choose to go out of business altogether, and your quantity supplied falls to zero.

Because the quantity supplied rises as the price rises and falls as the price falls, we say that the quantity supplied is *positively related* to the price of the good. This relationship between price and quantity supplied is called the **law of supply**: Other things equal, when the price of a good rises, the quantity supplied of the good also rises.

law of supply

the claim that, other things equal, the quantity supplied of a good rises when the price of the good rises

Input Prices To produce its output of ice cream, Student Sweets uses various inputs: cream, sugar, flavoring, ice-cream machines, the buildings in which the ice cream is made, and the labor of workers to mix the ingredients and operate the machines. When the price of one or more of these inputs rises, producing ice cream is less profitable, and your firm supplies less ice cream. If input prices rise substantially, you might shut down your firm and supply no ice cream at all. Thus, the supply of a good is negatively related to the price of the inputs used to make the good.

Technology The technology for turning the inputs into ice cream is yet another determinant of supply. The invention of the mechanized ice-cream machine, for example, reduced the amount of labor necessary to make ice cream. By reducing firms' costs, the advance in technology raised the supply of ice cream.

Expectations The amount of ice cream you supply today may depend on your expectations of the future. For example, if you expect the price of ice cream to rise in the future, you will put some of your current production into storage and supply less to the market today.

THE SUPPLY SCHEDULE AND THE SUPPLY CURVE

supply schedule

a table that shows the relationship between the price of a good and the quantity supplied

supply curve

a graph of the relationship between the price of a good and the quantity supplied

Consider how the quantity supplied varies with the price, holding input prices, technology, and expectations constant. Table 4-4 shows the quantity supplied by Ben, an ice-cream seller, at various prices of ice cream. At a price below \$1.00, Ben does not supply any ice cream at all. As the price rises, he supplies a greater and greater quantity. This table is called the **supply schedule**.

Figure 4-5 graphs the relationship between the quantity of ice cream supplied and the price. The curve relating price and quantity supplied is called the **supply curve**. The supply curve slopes upward because, *ceteris paribus*, a higher price means a greater quantity supplied.

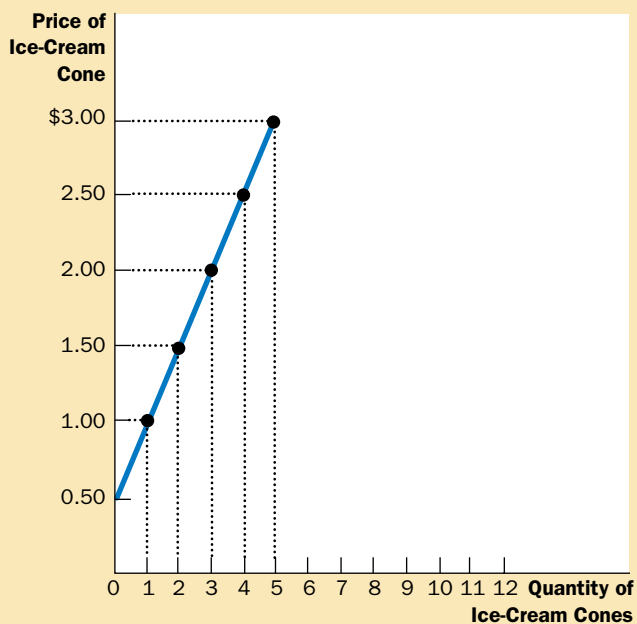
Table 4-4

BEN'S SUPPLY SCHEDULE. The supply schedule shows the quantity supplied at each price.

PRICE OF ICE-CREAM CONE	QUANTITY OF CONES SUPPLIED
\$0.00	0
0.50	0
1.00	1
1.50	2
2.00	3
2.50	4
3.00	5

Figure 4-5

BEN'S SUPPLY CURVE. This supply curve, which graphs the supply schedule in Table 4-4, shows how the quantity supplied of the good changes as its price varies. Because a higher price increases the quantity supplied, the supply curve slopes upward.



MARKET SUPPLY VERSUS INDIVIDUAL SUPPLY

Just as market demand is the sum of the demands of all buyers, market supply is the sum of the supplies of all sellers. Table 4-5 shows the supply schedules for two ice-cream producers—Ben and Jerry. At any price, Ben’s supply schedule tells us the quantity of ice cream Ben supplies, and Jerry’s supply schedule tells us the quantity of ice cream Jerry supplies. The market supply is the sum of the two individual supplies.

Market supply depends on all those factors that influence the supply of individual sellers, such as the prices of inputs used to produce the good, the available technology, and expectations. In addition, the supply in a market depends on the number of sellers. (If Ben or Jerry were to retire from the ice-cream business, the supply in the market would fall.) The supply schedules in Table 4-5 show what happens to quantity supplied as the price varies while all the other variables that determine quantity supplied are held constant.

Figure 4-6 shows the supply curves that correspond to the supply schedules in Table 4-5. As with demand curves, we sum the individual supply curves *horizontally* to obtain the market supply curve. That is, to find the total quantity supplied at any price, we add the individual quantities found on the horizontal axis of the individual supply curves. The market supply curve shows how the total quantity supplied varies as the price of the good varies.

SHIFTS IN THE SUPPLY CURVE

Suppose that the price of sugar falls. How does this change affect the supply of ice cream? Because sugar is an input into producing ice cream, the fall in the price of sugar makes selling ice cream more profitable. This raises the supply of ice cream: At any given price, sellers are now willing to produce a larger quantity. Thus, the supply curve for ice cream shifts to the right.

Whenever there is a change in any determinant of supply, other than the good’s price, the supply curve shifts. As Figure 4-7 shows, any change that raises quantity supplied at every price shifts the supply curve to the right. Similarly, any change that reduces the quantity supplied at every price shifts the supply curve to the left.

PRICE OF ICE-CREAM CONE	BEN		JERRY		MARKET
\$0.00	0	+	0	=	0
0.50	0		0		0
1.00	1		0		1
1.50	2		2		4
2.00	3		4		7
2.50	4		6		10
3.00	5		8		13

Table 4-5

INDIVIDUAL AND MARKET SUPPLY SCHEDULES. The quantity supplied in a market is the sum of the quantities supplied by all the sellers.

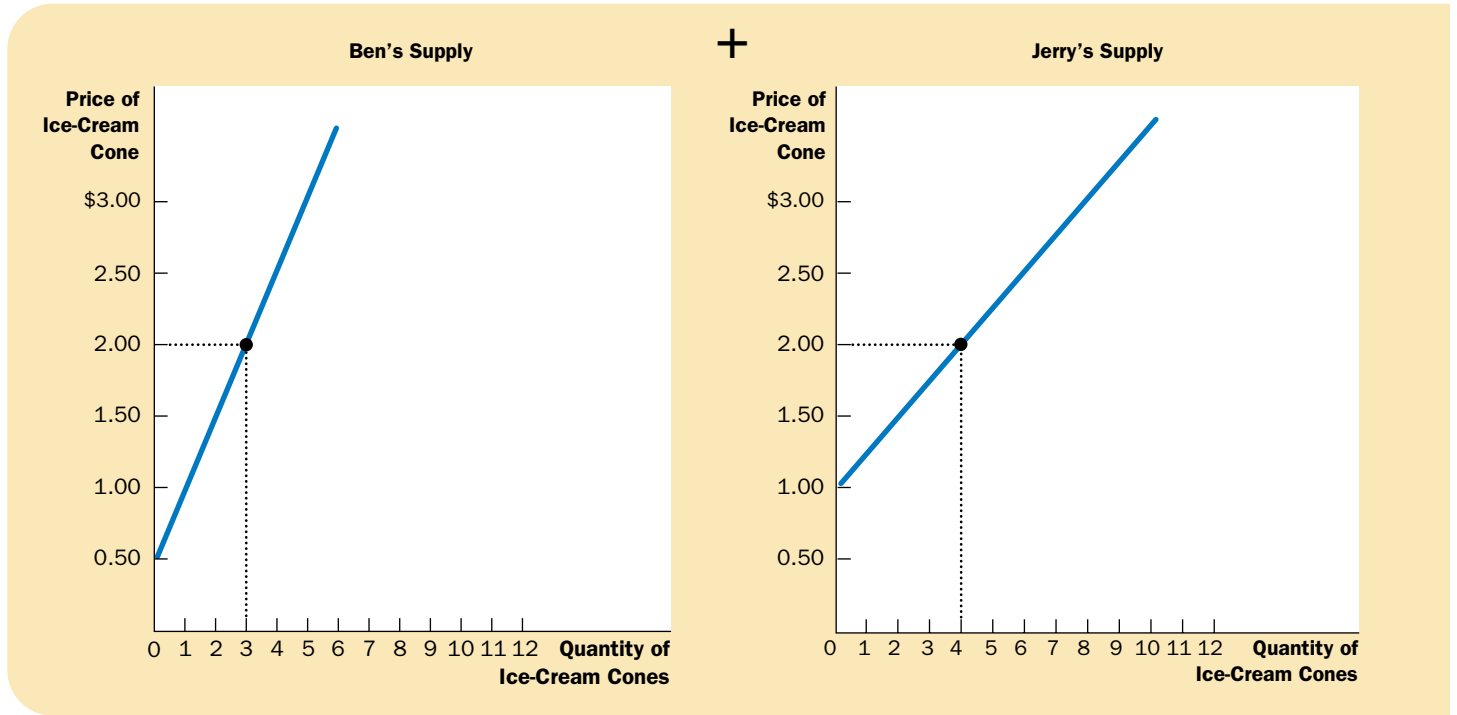
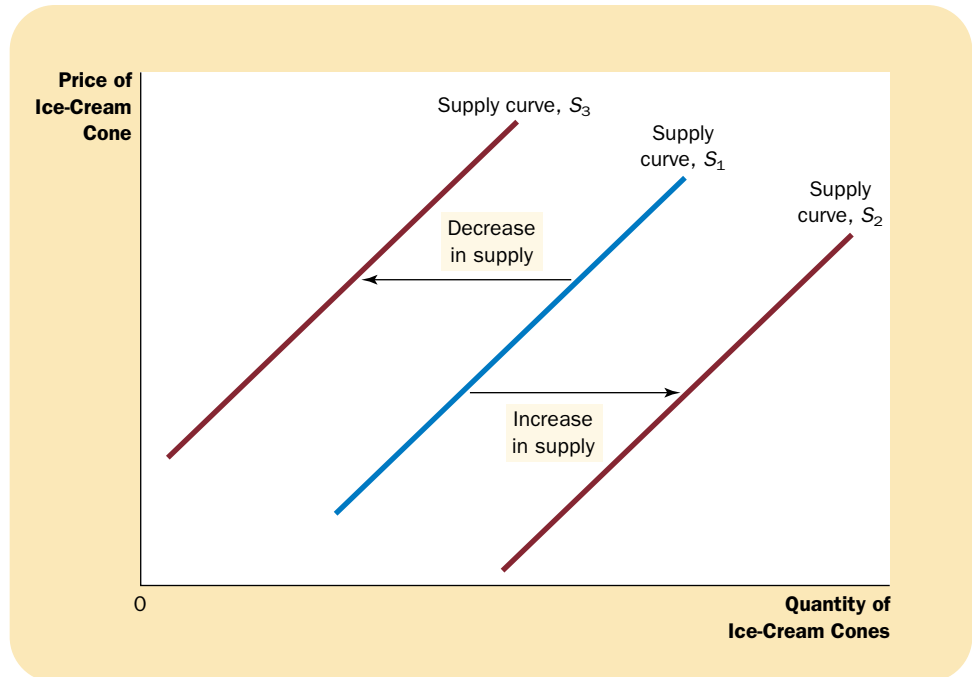


Figure 4-7

SHIFTS IN THE SUPPLY CURVE. Any change that raises the quantity that sellers wish to produce at a given price shifts the supply curve to the right. Any change that lowers the quantity that sellers wish to produce at a given price shifts the supply curve to the left.



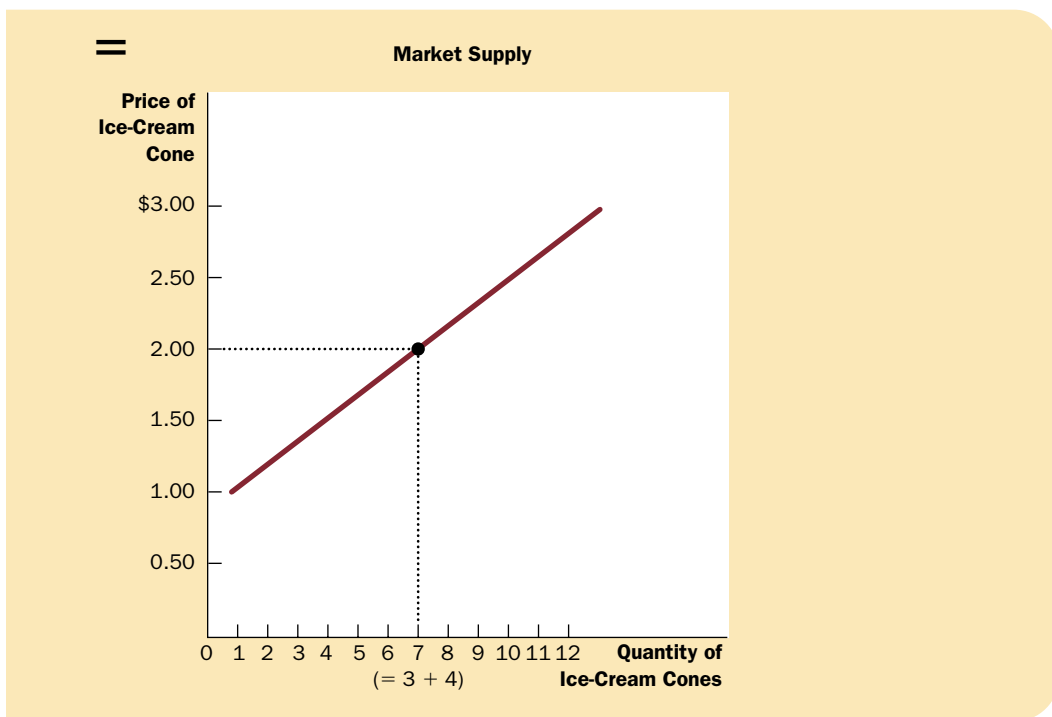


Figure 4-6

MARKET SUPPLY AS THE SUM OF INDIVIDUAL SUPPLIES. The market supply curve is found by adding horizontally the individual supply curves. At a price of \$2, Ben supplies 3 ice-cream cones, and Jerry supplies 4 ice-cream cones. The quantity supplied in the market at this price is 7 cones.

VARIABLES THAT AFFECT QUANTITY SUPPLIED	A CHANGE IN THIS VARIABLE . . .
Price	Represents a movement along the supply curve
Input prices	Shifts the supply curve
Technology	Shifts the supply curve
Expectations	Shifts the supply curve
Number of sellers	Shifts the supply curve

Table 4-6

THE DETERMINANTS OF QUANTITY SUPPLIED. This table lists the variables that can influence the quantity supplied in a market. Notice the special role that price plays: A change in the price represents a movement along the supply curve, whereas a change in one of the other variables shifts the supply curve.

Table 4-6 lists the variables that determine the quantity supplied in a market and how a change in the variable affects the supply curve. Once again, price plays a special role in the table. Because price is on the vertical axis when we graph a supply curve, a change in price does not shift the curve but represents a movement along it. By contrast, when there is a change in input prices, technology, expectations, or the number of sellers, the quantity supplied at each price changes; this is represented by a shift in the supply curve.

In summary, *the supply curve shows what happens to the quantity supplied of a good when its price varies, holding constant all other determinants of quantity supplied. When one of these other determinants changes, the supply curve shifts.*

QUICK QUIZ: List the determinants of the quantity of pizza supplied.

- ◆ Make up an example of a supply schedule for pizza, and graph the implied supply curve.
- ◆ Give an example of something that would shift this supply curve.
- ◆ Would a change in the price of pizza shift this supply curve?

SUPPLY AND DEMAND TOGETHER

Having analyzed supply and demand separately, we now combine them to see how they determine the quantity of a good sold in a market and its price.

equilibrium

a situation in which supply and demand have been brought into balance

equilibrium price

the price that balances supply and demand

equilibrium quantity

the quantity supplied and the quantity demanded when the price has adjusted to balance supply and demand

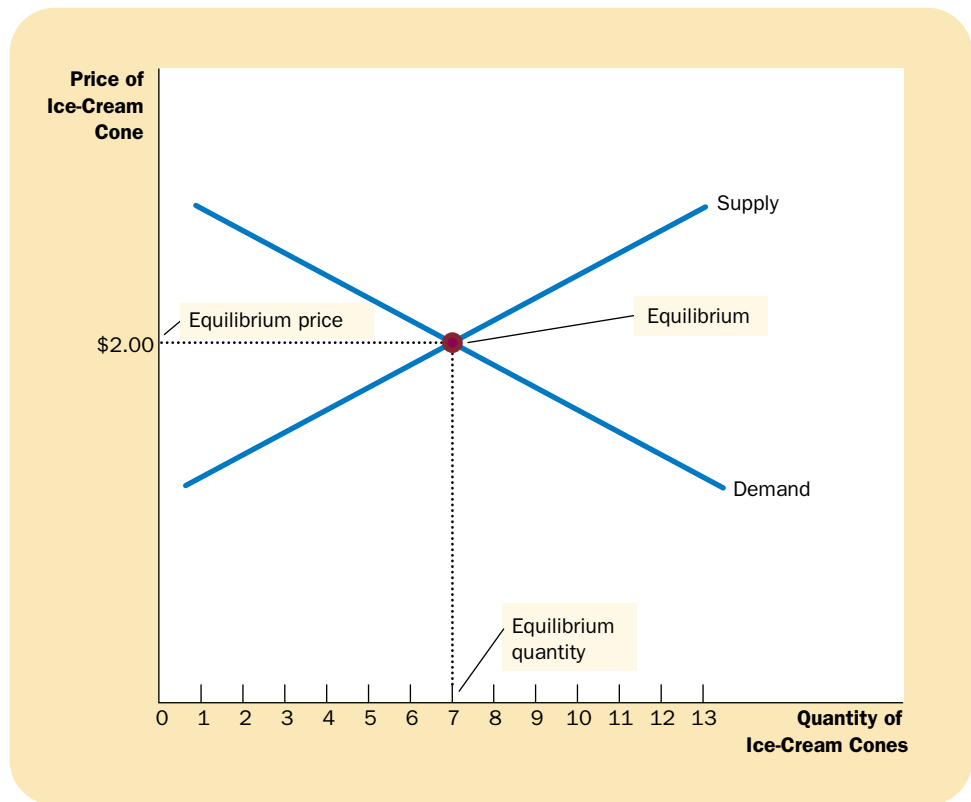
EQUILIBRIUM

Figure 4-8 shows the market supply curve and market demand curve together. Notice that there is one point at which the supply and demand curves intersect; this point is called the market's **equilibrium**. The price at which these two curves cross is called the **equilibrium price**, and the quantity is called the **equilibrium quantity**. Here the equilibrium price is \$2.00 per cone, and the equilibrium quantity is 7 ice-cream cones.

The dictionary defines the word *equilibrium* as a situation in which various forces are in balance—and this also describes a market's equilibrium. *At the*

Figure 4-8

THE EQUILIBRIUM OF SUPPLY AND DEMAND. The equilibrium is found where the supply and demand curves intersect. At the equilibrium price, the quantity supplied equals the quantity demanded. Here the equilibrium price is \$2: At this price, 7 ice-cream cones are supplied, and 7 ice-cream cones are demanded.



equilibrium price, the quantity of the good that buyers are willing and able to buy exactly balances the quantity that sellers are willing and able to sell. The equilibrium price is sometimes called the *market-clearing price* because, at this price, everyone in the market has been satisfied: Buyers have bought all they want to buy, and sellers have sold all they want to sell.

The actions of buyers and sellers naturally move markets toward the equilibrium of supply and demand. To see why, consider what happens when the market price is not equal to the equilibrium price.

Suppose first that the market price is above the equilibrium price, as in panel (a) of Figure 4-9. At a price of \$2.50 per cone, the quantity of the good supplied (10 cones) exceeds the quantity demanded (4 cones). There is a **surplus** of the good: Suppliers are unable to sell all they want at the going price. When there is a surplus in the ice-cream market, for instance, sellers of ice cream find their freezers increasingly full of ice cream they would like to sell but cannot. They respond to the surplus by cutting their prices. Prices continue to fall until the market reaches the equilibrium.

Suppose now that the market price is below the equilibrium price, as in panel (b) of Figure 4-9. In this case, the price is \$1.50 per cone, and the quantity of the good demanded exceeds the quantity supplied. There is a **shortage** of the good: Demanders are unable to buy all they want at the going price. When a shortage occurs in the ice-cream market, for instance, buyers have to wait in long lines for a chance to buy one of the few cones that are available. With too many buyers chasing too few goods, sellers can respond to the shortage by raising their prices without losing sales. As prices rise, the market once again moves toward the equilibrium.

Thus, the activities of the many buyers and sellers automatically push the market price toward the equilibrium price. Once the market reaches its equilibrium, all buyers and sellers are satisfied, and there is no upward or downward pressure on the price. How quickly equilibrium is reached varies from market to market, depending on how quickly prices adjust. In most free markets, however, surpluses and shortages are only temporary because prices eventually move toward their equilibrium levels. Indeed, this phenomenon is so pervasive that it is sometimes called the **law of supply and demand**: The price of any good adjusts to bring the supply and demand for that good into balance.

surplus

a situation in which quantity supplied is greater than quantity demanded

shortage

a situation in which quantity demanded is greater than quantity supplied

law of supply and demand

the claim that the price of any good adjusts to bring the supply and demand for that good into balance

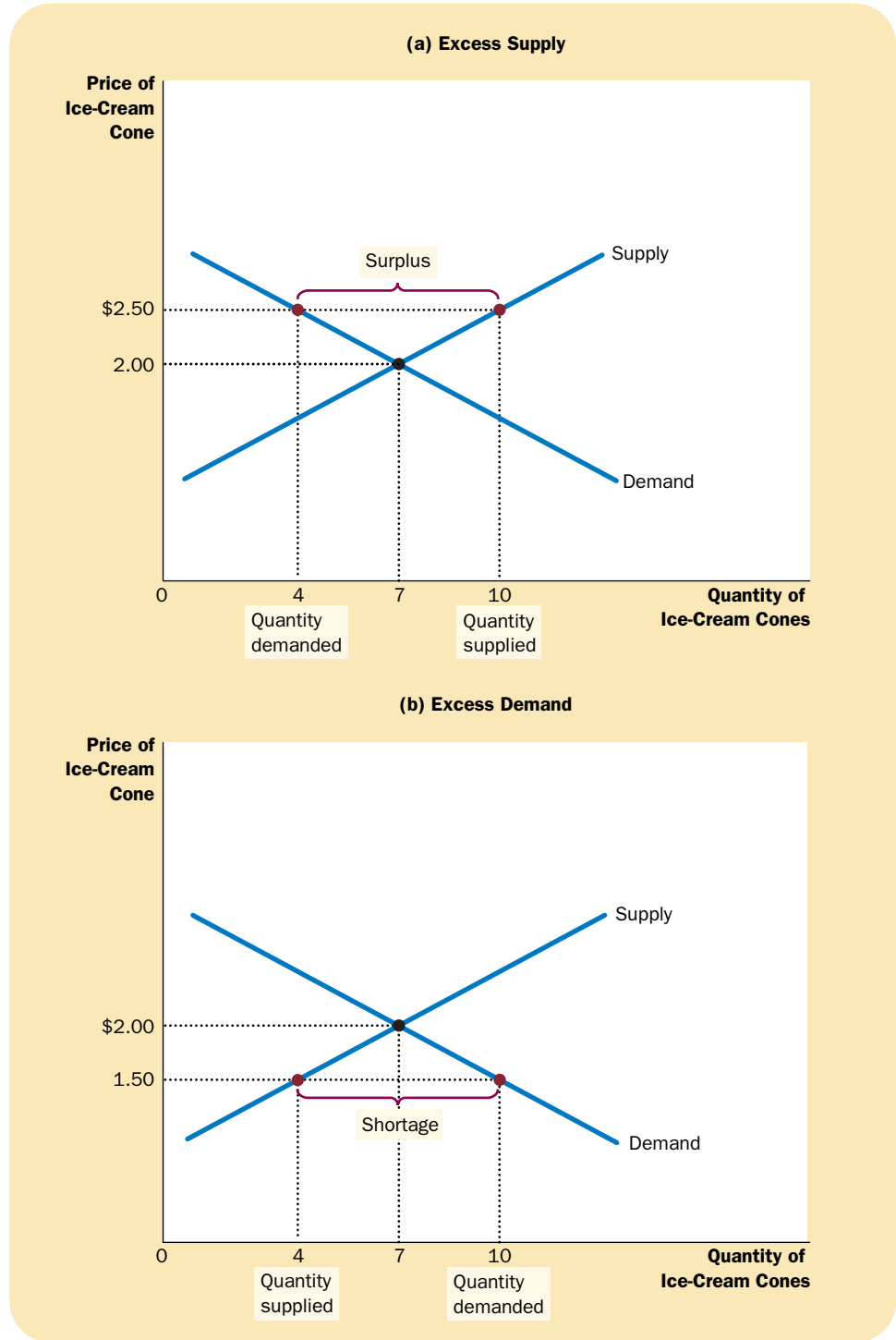
THREE STEPS TO ANALYZING CHANGES IN EQUILIBRIUM

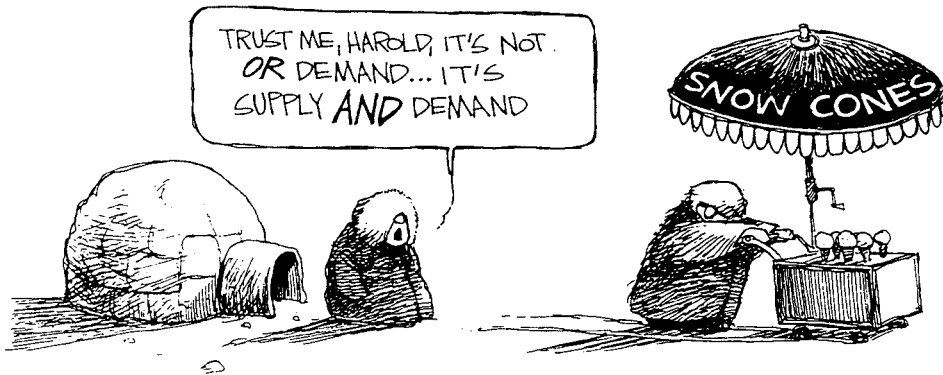
So far we have seen how supply and demand together determine a market's equilibrium, which in turn determines the price of the good and the amount of the good that buyers purchase and sellers produce. Of course, the equilibrium price and quantity depend on the position of the supply and demand curves. When some event shifts one of these curves, the equilibrium in the market changes. The analysis of such a change is called *comparative statics* because it involves comparing two static situations—an old and a new equilibrium.

When analyzing how some event affects a market, we proceed in three steps. First, we decide whether the event shifts the supply curve, the demand curve, or in some cases both curves. Second, we decide whether the curve shifts to the right or to the left. Third, we use the supply-and-demand diagram to examine how the

Figure 4-9

MARKETS NOT IN EQUILIBRIUM. In panel (a), there is a surplus. Because the market price of \$2.50 is above the equilibrium price, the quantity supplied (10 cones) exceeds the quantity demanded (4 cones). Suppliers try to increase sales by cutting the price of a cone, and this moves the price toward its equilibrium level. In panel (b), there is a shortage. Because the market price of \$1.50 is below the equilibrium price, the quantity demanded (10 cones) exceeds the quantity supplied (4 cones). With too many buyers chasing too few goods, suppliers can take advantage of the shortage by raising the price. Hence, in both cases, the price adjustment moves the market toward the equilibrium of supply and demand.





shift affects the equilibrium price and quantity. Table 4-7 summarizes these three steps. To see how this recipe is used, let's consider various events that might affect the market for ice cream.

Example: A Change in Demand Suppose that one summer the weather is very hot. How does this event affect the market for ice cream? To answer this question, let's follow our three steps.

1. The hot weather affects the demand curve by changing people's taste for ice cream. That is, the weather changes the amount of ice cream that people want to buy at any given price. The supply curve is unchanged because the weather does not directly affect the firms that sell ice cream.
2. Because hot weather makes people want to eat more ice cream, the demand curve shifts to the right. Figure 4-10 shows this increase in demand as the shift in the demand curve from D_1 to D_2 . This shift indicates that the quantity of ice cream demanded is higher at every price.
3. As Figure 4-10 shows, the increase in demand raises the equilibrium price from \$2.00 to \$2.50 and the equilibrium quantity from 7 to 10 cones. In other words, the hot weather increases the price of ice cream and the quantity of ice cream sold.

Shifts in Curves versus Movements along Curves Notice that when hot weather drives up the price of ice cream, the quantity of ice cream that firms supply rises, even though the supply curve remains the same. In this case, economists say there has been an increase in "quantity supplied" but no change in "supply."

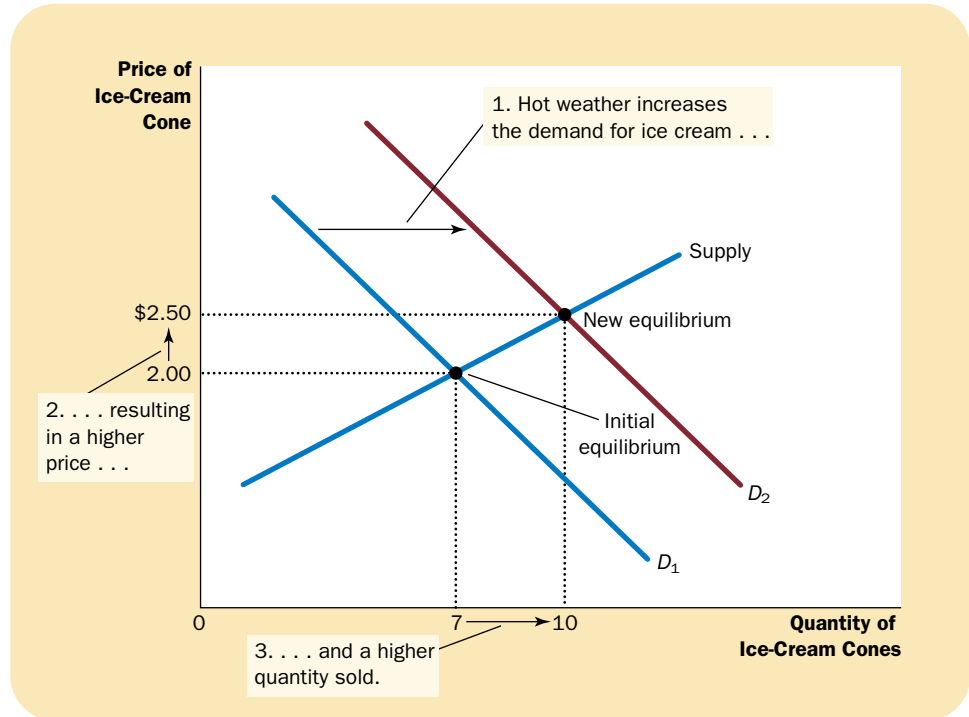
1. Decide whether the event shifts the supply curve or demand curve (or perhaps both).
2. Decide which direction the curve shifts.
3. Use the supply-and-demand diagram to see how the shift changes the equilibrium.

Table 4-7

A THREE-STEP PROGRAM FOR
ANALYZING CHANGES IN
EQUILIBRIUM

Figure 4-10

HOW AN INCREASE IN DEMAND AFFECTS THE EQUILIBRIUM. An event that raises quantity demanded at any given price shifts the demand curve to the right. The equilibrium price and the equilibrium quantity both rise. Here, an abnormally hot summer causes buyers to demand more ice cream. The demand curve shifts from D_1 to D_2 , which causes the equilibrium price to rise from \$2.00 to \$2.50 and the equilibrium quantity to rise from 7 to 10 cones.

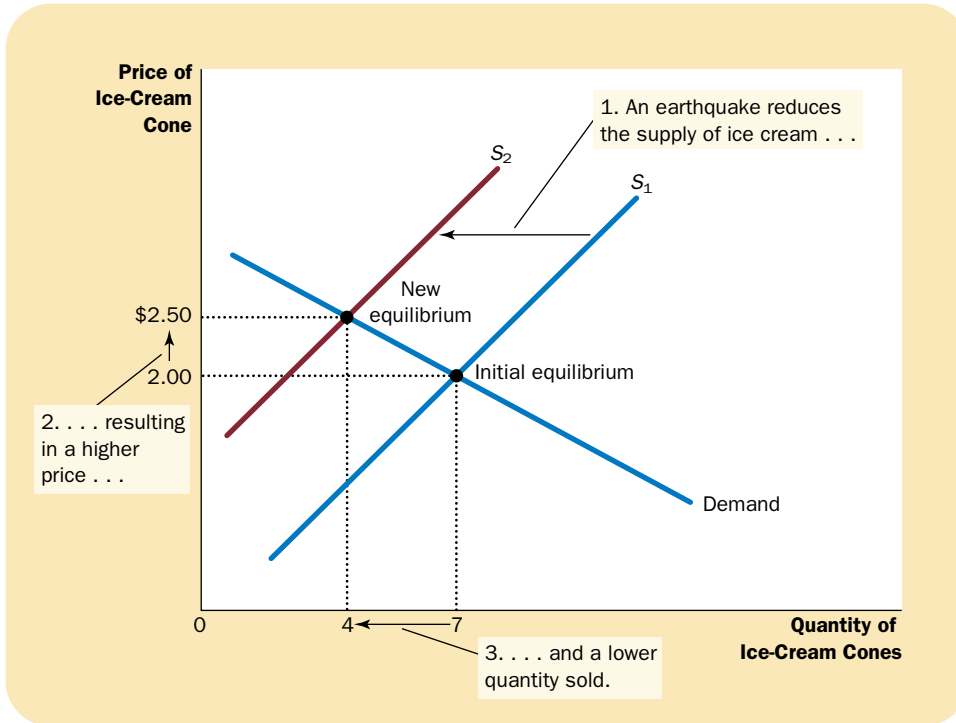


“Supply” refers to the position of the supply curve, whereas the “quantity supplied” refers to the amount suppliers wish to sell. In this example, supply does not change because the weather does not alter firms’ desire to sell at any given price. Instead, the hot weather alters consumers’ desire to buy at any given price and thereby shifts the demand curve. The increase in demand causes the equilibrium price to rise. When the price rises, the quantity supplied rises. This increase in quantity supplied is represented by the movement along the supply curve.

To summarize, a shift *in* the supply curve is called a “change in supply,” and a shift *in* the demand curve is called a “change in demand.” A movement *along* a fixed supply curve is called a “change in the quantity supplied,” and a movement *along* a fixed demand curve is called a “change in the quantity demanded.”

Example: A Change in Supply Suppose that, during another summer, an earthquake destroys several ice-cream factories. How does this event affect the market for ice cream? Once again, to answer this question, we follow our three steps.

1. The earthquake affects the supply curve. By reducing the number of sellers, the earthquake changes the amount of ice cream that firms produce and sell at any given price. The demand curve is unchanged because the earthquake does not directly change the amount of ice cream households wish to buy.
2. The supply curve shifts to the left because, at every price, the total amount that firms are willing and able to sell is reduced. Figure 4-11 illustrates this decrease in supply as a shift in the supply curve from S_1 to S_2 .

**Figure 4-11**

HOW A DECREASE IN SUPPLY AFFECTS THE EQUILIBRIUM.

An event that reduces quantity supplied at any given price shifts the supply curve to the left. The equilibrium price rises, and the equilibrium quantity falls. Here, an earthquake causes sellers to supply less ice cream. The supply curve shifts from S_1 to S_2 , which causes the equilibrium price to rise from \$2.00 to \$2.50 and the equilibrium quantity to fall from 7 to 4 cones.

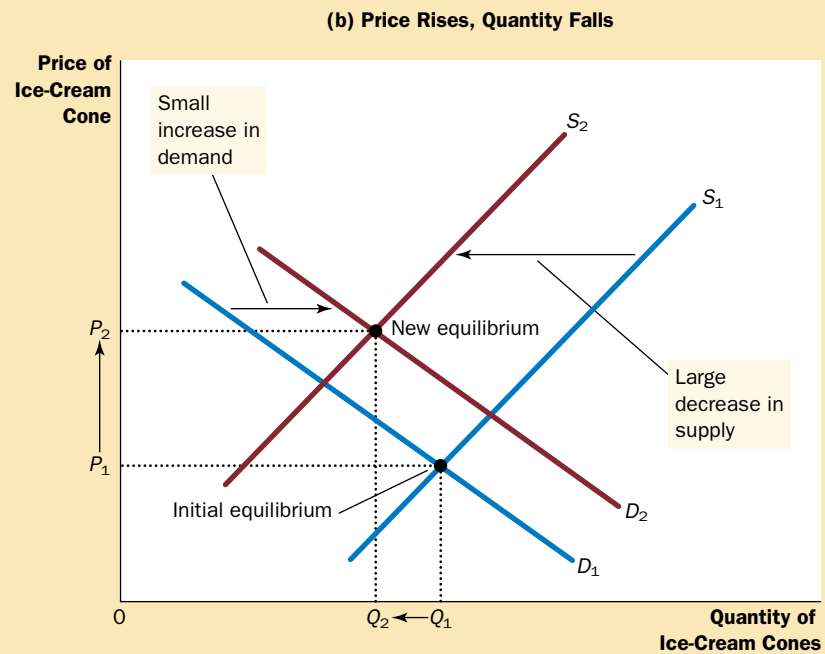
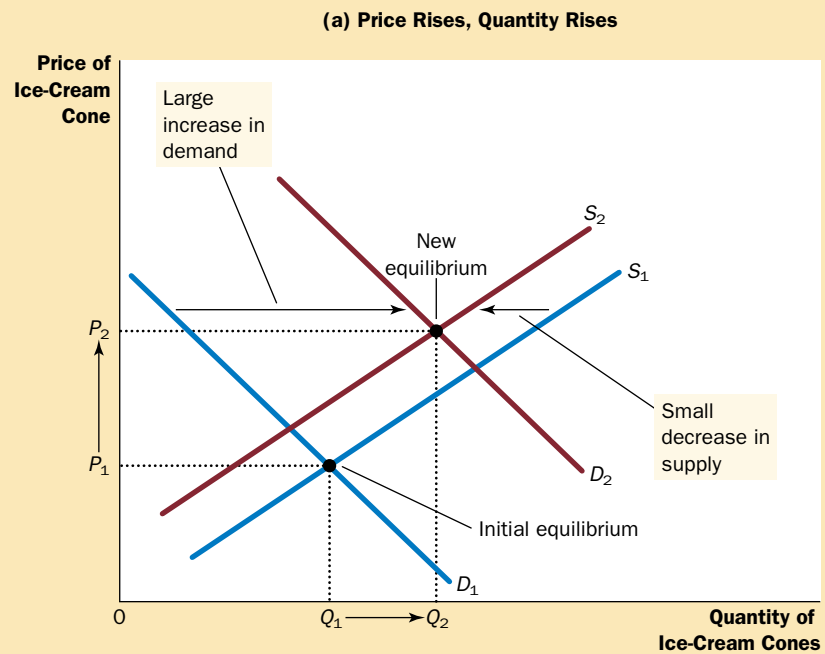
- As Figure 4-11 shows, the shift in the supply curve raises the equilibrium price from \$2.00 to \$2.50 and lowers the equilibrium quantity from 7 to 4 cones. As a result of the earthquake, the price of ice cream rises, and the quantity of ice cream sold falls.

Example: A Change in Both Supply and Demand Now suppose that the hot weather and the earthquake occur at the same time. To analyze this combination of events, we again follow our three steps.

- We determine that both curves must shift. The hot weather affects the demand curve because it alters the amount of ice cream that households want to buy at any given price. At the same time, the earthquake alters the supply curve because it changes the amount of ice cream that firms want to sell at any given price.
- The curves shift in the same directions as they did in our previous analysis: The demand curve shifts to the right, and the supply curve shifts to the left. Figure 4-12 illustrates these shifts.
- As Figure 4-12 shows, there are two possible outcomes that might result, depending on the relative size of the demand and supply shifts. In both cases, the equilibrium price rises. In panel (a), where demand increases substantially while supply falls just a little, the equilibrium quantity also rises. By contrast, in panel (b), where supply falls substantially while demand rises just a little, the equilibrium quantity falls. Thus, these events certainly raise the price of ice cream, but their impact on the amount of ice cream sold is ambiguous.

Figure 4-12

A SHIFT IN BOTH SUPPLY AND DEMAND. Here we observe a simultaneous increase in demand and decrease in supply. Two outcomes are possible. In panel (a), the equilibrium price rises from P_1 to P_2 , and the equilibrium quantity rises from Q_1 to Q_2 . In panel (b), the equilibrium price again rises from P_1 to P_2 , but the equilibrium quantity falls from Q_1 to Q_2 .



Summary We have just seen three examples of how to use supply and demand curves to analyze a change in equilibrium. Whenever an event shifts the supply curve, the demand curve, or perhaps both curves, you can use these tools to predict how the event will alter the amount sold in equilibrium and the price at which the

IN THE NEWS

*Mother Nature Shifts
the Supply Curve*



ACCORDING TO OUR ANALYSIS, A NATURAL disaster that reduces supply reduces the quantity sold and raises the price. Here's a recent example.

**4-Day Cold Spell Slams
California: Crops Devastated;
Price of Citrus to Rise**

BY TODD S. PURDUM

A brutal four-day freeze has destroyed more than a third of California's annual

citrus crop, inflicting upwards of a half-billion dollars in damage and raising the prospect of tripled orange prices in supermarkets by next week.

Throughout the Golden State, cold, dry air from the Gulf of Alaska sent temperatures below freezing beginning Monday, with readings in the high teens and low 20's in agriculturally rich Central Valley early today—the worst cold spell since a 10-day freeze in 1990. Farmers frantically ran wind and irrigation machines overnight to keep trees warm, but officials pronounced a near total loss in the valley, and said perhaps half of the state's orange crop was lost as well. . . .

California grows about 80 percent of the nation's oranges eaten as fruit, and 90 percent of lemons, and wholesalers said the retail prices of oranges could triple in the next few days. The price of lemons was certain to rise as well, but the price of orange juice should



be less affected because most juice oranges are grown in Florida.

In some California markets, wholesalers reported that the price of navel oranges had increased to 90 cents a pound on Wednesday from 35 cents on Tuesday.

SOURCE: *The New York Times*, December 25, 1998, p. A1.

Table 4-8

WHAT HAPPENS TO PRICE AND QUANTITY WHEN SUPPLY OR DEMAND SHIFTS?

	NO CHANGE IN SUPPLY	AN INCREASE IN SUPPLY	A DECREASE IN SUPPLY
NO CHANGE IN DEMAND	<i>P</i> same <i>Q</i> same	<i>P</i> down <i>Q</i> up	<i>P</i> up <i>Q</i> down
AN INCREASE IN DEMAND	<i>P</i> up <i>Q</i> up	<i>P</i> ambiguous <i>Q</i> up	<i>P</i> up <i>Q</i> ambiguous
A DECREASE IN DEMAND	<i>P</i> down <i>Q</i> down	<i>P</i> down <i>Q</i> ambiguous	<i>P</i> ambiguous <i>Q</i> down

good is sold. Table 4-8 shows the predicted outcome for any combination of shifts in the two curves. To make sure you understand how to use the tools of supply and demand, pick a few entries in this table and make sure you can explain to yourself why the table contains the prediction it does.

QUICK QUIZ: Analyze what happens to the market for pizza if the price of tomatoes rises. ♦ Analyze what happens to the market for pizza if the price of hamburgers falls.

CONCLUSION: HOW PRICES ALLOCATE RESOURCES

This chapter has analyzed supply and demand in a single market. Although our discussion has centered around the market for ice cream, the lessons learned here apply in most other markets as well. Whenever you go to a store to buy something, you are contributing to the demand for that item. Whenever you look for a job, you are contributing to the supply of labor services. Because supply and demand are such pervasive economic phenomena, the model of supply and demand is a powerful tool for analysis. We will be using this model repeatedly in the following chapters.



One of the *Ten Principles of Economics* discussed in Chapter 1 is that markets are usually a good way to organize economic activity. Although it is still too early to judge whether market outcomes are good or bad, in this chapter we have begun to see how markets work. In any economic system, scarce resources have to be allocated among competing uses. Market economies harness the forces of supply and demand to serve that end. Supply and demand together determine the prices of the economy's many different goods and services; prices in turn are the signals that guide the allocation of resources.

For example, consider the allocation of beachfront land. Because the amount of this land is limited, not everyone can enjoy the luxury of living by the beach. Who gets this resource? The answer is: whoever is willing and able to pay the price. The price of beachfront land adjusts until the quantity of land demanded exactly balances the quantity supplied. Thus, in market economies, prices are the mechanism for rationing scarce resources.

Similarly, prices determine who produces each good and how much is produced. For instance, consider farming. Because we need food to survive, it is crucial that some people work on farms. What determines who is a farmer and who is not? In a free society, there is no government planning agency making this decision and ensuring an adequate supply of food. Instead, the allocation of workers to farms is based on the job decisions of millions of workers. This decentralized system works well because these decisions depend on prices. The prices of food and the wages of farmworkers (the price of their labor) adjust to ensure that enough people choose to be farmers.

If a person had never seen a market economy in action, the whole idea might seem preposterous. Economies are large groups of people engaged in many interdependent activities. What prevents decentralized decisionmaking from degenerating into chaos? What coordinates the actions of the millions of people with their varying abilities and desires? What ensures that what needs to get done does in fact get done? The answer, in a word, is *prices*. If market economies are guided by an invisible hand, as Adam Smith famously suggested, then the price system is the baton that the invisible hand uses to conduct the economic orchestra.



“Two dollars.”



“—and seventy-five cents.”

Summary

- ◆ Economists use the model of supply and demand to analyze competitive markets. In a competitive market, there are many buyers and sellers, each of whom has little or no influence on the market price.
- ◆ The demand curve shows how the quantity of a good demanded depends on the price. According to the law of demand, as the price of a good falls, the quantity demanded rises. Therefore, the demand curve slopes downward.
- ◆ In addition to price, other determinants of the quantity demanded include income, tastes, expectations, and the prices of substitutes and complements. If one of these other determinants changes, the demand curve shifts.
- ◆ The supply curve shows how the quantity of a good supplied depends on the price. According to the law of supply, as the price of a good rises, the quantity supplied rises. Therefore, the supply curve slopes upward.
- ◆ In addition to price, other determinants of the quantity supplied include input prices, technology, and expectations. If one of these other determinants changes, the supply curve shifts.
- ◆ The intersection of the supply and demand curves determines the market equilibrium. At the equilibrium price, the quantity demanded equals the quantity supplied.
- ◆ The behavior of buyers and sellers naturally drives markets toward their equilibrium. When the market price is above the equilibrium price, there is a surplus of the good, which causes the market price to fall. When the market price is below the equilibrium price, there is a shortage, which causes the market price to rise.
- ◆ To analyze how any event influences a market, we use the supply-and-demand diagram to examine how the event affects the equilibrium price and quantity. To do this we follow three steps. First, we decide whether the event shifts the supply curve or the demand curve (or both). Second, we decide which direction the curve shifts. Third, we compare the new equilibrium with the old equilibrium.
- ◆ In market economies, prices are the signals that guide economic decisions and thereby allocate scarce resources. For every good in the economy, the price ensures that supply and demand are in balance. The equilibrium price then determines how much of the good buyers choose to purchase and how much sellers choose to produce.

Key Concepts

market, p. 66	complements, p. 68	supply curve, p. 76
competitive market, p. 66	demand schedule, p. 69	equilibrium, p. 80
quantity demanded, p. 67	demand curve, p. 70	equilibrium price, p. 80
law of demand, p. 68	<i>ceteris paribus</i> , p. 70	equilibrium quantity, p. 80
normal good, p. 68	quantity supplied, p. 75	surplus, p. 81
inferior good, p. 68	law of supply, p. 75	shortage, p. 81
substitutes, p. 68	supply schedule, p. 76	law of supply and demand, p. 81

Questions for Review

1. What is a competitive market? Briefly describe the types of markets other than perfectly competitive markets.
2. What determines the quantity of a good that buyers demand?
3. What are the demand schedule and the demand curve, and how are they related? Why does the demand curve slope downward?
4. Does a change in consumers' tastes lead to a movement along the demand curve or a shift in the demand curve? Does a change in price lead to a movement along the demand curve or a shift in the demand curve?
5. Popeye's income declines and, as a result, he buys more spinach. Is spinach an inferior or a normal good? What happens to Popeye's demand curve for spinach?
6. What determines the quantity of a good that sellers supply?
7. What are the supply schedule and the supply curve, and how are they related? Why does the supply curve slope upward?
8. Does a change in producers' technology lead to a movement along the supply curve or a shift in the supply curve? Does a change in price lead to a movement along the supply curve or a shift in the supply curve?
9. Define the equilibrium of a market. Describe the forces that move a market toward its equilibrium.
10. Beer and pizza are complements because they are often enjoyed together. When the price of beer rises, what happens to the supply, demand, quantity supplied, quantity demanded, and the price in the market for pizza?
11. Describe the role of prices in market economies.

Problems and Applications

1. Explain each of the following statements using supply-and-demand diagrams.
 - a. When a cold snap hits Florida, the price of orange juice rises in supermarkets throughout the country.
 - b. When the weather turns warm in New England every summer, the prices of hotel rooms in Caribbean resorts plummet.
 - c. When a war breaks out in the Middle East, the price of gasoline rises, while the price of a used Cadillac falls.
2. "An increase in the demand for notebooks raises the quantity of notebooks demanded, but not the quantity supplied." Is this statement true or false? Explain.
3. Consider the market for minivans. For each of the events listed here, identify which of the determinants of demand or supply are affected. Also indicate whether demand or supply is increased or decreased. Then show the effect on the price and quantity of minivans.
 - a. People decide to have more children.

- b. A strike by steelworkers raises steel prices.
 - c. Engineers develop new automated machinery for the production of minivans.
 - d. The price of station wagons rises.
 - e. A stock-market crash lowers people’s wealth.
4. During the 1990s, technological advance reduced the cost of computer chips. How do you think this affected the market for computers? For computer software? For typewriters?
 5. Using supply-and-demand diagrams, show the effect of the following events on the market for sweatshirts.
 - a. A hurricane in South Carolina damages the cotton crop.
 - b. The price of leather jackets falls.
 - c. All colleges require morning calisthenics in appropriate attire.
 - d. New knitting machines are invented.
 6. Suppose that in the year 2005 the number of births is temporarily high. How does this baby boom affect the price of baby-sitting services in 2010 and 2020? (Hint: 5-year-olds need baby-sitters, whereas 15-year-olds can be baby-sitters.)
 7. Ketchup is a complement (as well as a condiment) for hot dogs. If the price of hot dogs rises, what happens to the market for ketchup? For tomatoes? For tomato juice? For orange juice?
 8. The case study presented in the chapter discussed cigarette taxes as a way to reduce smoking. Now think about the markets for other tobacco products such as cigars and chewing tobacco.
 - a. Are these goods substitutes or complements for cigarettes?
 - b. Using a supply-and-demand diagram, show what happens in the markets for cigars and chewing tobacco if the tax on cigarettes is increased.
 - c. If policymakers wanted to reduce total tobacco consumption, what policies could they combine with the cigarette tax?
 9. The market for pizza has the following demand and supply schedules:

PRICE	QUANTITY DEMANDED	QUANTITY SUPPLIED
\$4	135	26
5	104	53
6	81	81
7	68	98
8	53	110
9	39	121

Graph the demand and supply curves. What is the equilibrium price and quantity in this market? If the actual price in this market were *above* the equilibrium price, what would drive the market toward the equilibrium? If the actual price in this market were *below* the equilibrium price, what would drive the market toward the equilibrium?

10. Because bagels and cream cheese are often eaten together, they are complements.
 - a. We observe that both the equilibrium price of cream cheese and the equilibrium quantity of bagels have risen. What could be responsible for this pattern—a fall in the price of flour or a fall in the price of milk? Illustrate and explain your answer.
 - b. Suppose instead that the equilibrium price of cream cheese has risen but the equilibrium quantity of bagels has fallen. What could be responsible for this pattern—a rise in the price of flour or a rise in the price of milk? Illustrate and explain your answer.
11. Suppose that the price of basketball tickets at your college is determined by market forces. Currently, the demand and supply schedules are as follows:

PRICE	QUANTITY DEMANDED	QUANTITY SUPPLIED
\$ 4	10,000	8,000
8	8,000	8,000
12	6,000	8,000
16	4,000	8,000
20	2,000	8,000

- a. Draw the demand and supply curves. What is unusual about this supply curve? Why might this be true?
- b. What are the equilibrium price and quantity of tickets?
- c. Your college plans to increase total enrollment next year by 5,000 students. The additional students will have the following demand schedule:

PRICE	QUANTITY DEMANDED
\$ 4	4,000
8	3,000
12	2,000
16	1,000
20	0

Now add the old demand schedule and the demand schedule for the new students to calculate the new demand schedule for the entire college. What will be the new equilibrium price and quantity?

12. An article in *The New York Times* described a successful marketing campaign by the French champagne industry.

The article noted that “many executives felt giddy about the stratospheric champagne prices. But they also feared that such sharp price increases would cause demand to decline, which would then cause prices to plunge.” What mistake are the executives making in their analysis of the situation? Illustrate your answer with a graph.