

**After reading this chapter, you should be able to:**

- 1** Describe *demand* and explain how it can change.
- 2** Describe *supply* and explain how it can change.
- 3** Relate how supply and demand interact to determine market equilibrium.
- 4** Explain how changes in supply and demand affect equilibrium prices and quantities.
- 5** Identify what government-set prices are and how they can cause product surpluses and shortages.

## Demand, Supply, and Market Equilibrium

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The model of supply and demand is the economics profession's greatest contribution to human understanding because it explains the operation of the markets on which we depend for nearly everything that we eat, drink, or consume. The model is so powerful and so widely used that to many people it *is* economics.

Markets bring together buyers (“demanders”) and sellers (“suppliers”) and exist in many forms. The corner gas station, an e-commerce site, the local music store, a farmer’s roadside stand—all are familiar markets. The New York Stock Exchange and the Chicago Board of Trade are markets where buyers and sellers of stocks and bonds and farm commodities from all over the world communicate with one another to buy and sell. Auctioneers bring together potential buyers and sellers of art, live-stock, used farm equipment, and, sometimes, real estate.

Some markets are local, while others are national or international. Some are highly personal, involving face-to-face contact between demander and supplier; others are faceless, with buyer and seller never seeing or knowing each other. But all competitive markets involve demand and supply, and this chapter discusses how the model works to explain both the *quantities* that are bought and sold in markets as well as the *prices* at which they trade.

## Demand

**Demand** is a schedule or a curve that shows the various amounts of a product that consumers will purchase at each of several possible prices during a specified period of time.<sup>1</sup> The table in Figure 3.1 is a hypothetical demand schedule for a *single consumer* purchasing a particular product, in this case, lattes. (For simplicity, we will categorize all espresso drinks as “lattes” and assume a highly competitive market.)

The table reveals that, if the price of lattes were \$5 each, Joe Java would buy 10 lattes per month; if it were \$4, he would buy 20 lattes per month; and so forth.

The table does not tell us which of the five possible prices will actually exist in the market. That depends on the interaction between demand and supply. Demand is simply a statement of a buyer’s plans, or intentions, with respect to the purchase of a product.

To be meaningful, the quantities demanded at each price must relate to a specific period—a day, a week, a month. Here that period is 1 month.

## Law of Demand

A fundamental characteristic of demand is this: Other things equal, as price falls, the quantity demanded rises, and as price rises, the quantity demanded falls. In short, there

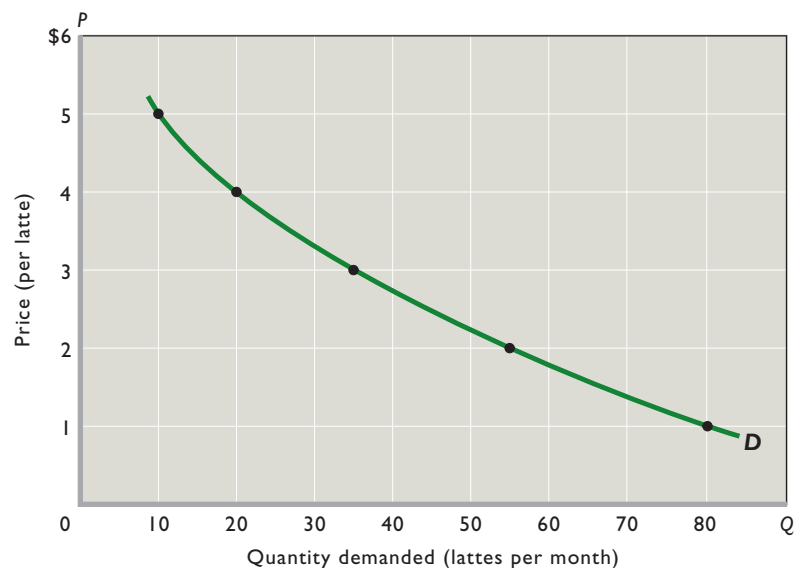
### demand

A schedule or curve that shows the various amounts of a product that consumers will buy at each of a series of possible prices during a specific period.

<sup>1</sup>This definition obviously is worded to apply to product markets. To adjust it to apply to resource markets, substitute the word “resource” for “product” and the word “businesses” for “consumers.”

**FIGURE 3.1 Joe Java’s demand for lattes.** Because price and quantity demanded are inversely related, an individual’s demand schedule graphs as a downsloping curve such as *D*. Other things equal, consumers will buy more of a product as its price declines and less of the product as its price rises. (Here and in later figures, *P* stands for price and *Q* stands for quantity demanded or supplied.)

Joe Java’s Demand for Lattes	
Price per Latte	Quantity Demanded per Month
\$5	10
4	20
3	35
2	55
1	80



**law of demand**

The principle that, other things equal, as price falls, the quantity demanded rises, and as price rises, the quantity demanded falls.

**demand curve**

A curve illustrating the inverse relationship between the price of a product and the quantity of it demanded, other things equal.

**determinants of demand**

Factors other than price that locate the position of a demand curve.

is an *inverse* relationship between price and quantity demanded. Economists call this inverse relationship the **law of demand**.

The other-things-equal assumption is critical here. Many factors other than the price of the product being considered affect the amount purchased. The quantity of lattes purchased will depend not only on the price of lattes but also on the prices of such substitutes as tea, soda, fruit juice, and bottled water. The law of demand in this case says that fewer lattes will be purchased if the price of lattes rises while the prices of tea, soda, fruit juice, and bottled water all remain constant.

The law of demand is consistent with both common sense and observation. People ordinarily *do* buy more of a product at a low price than at a high price. Price is an obstacle that deters consumers from buying. The higher that obstacle, the less of a product they will buy; the lower the obstacle, the more they will buy. The fact that businesses reduce prices to clear out unsold goods is evidence of their belief in the law of demand.

## The Demand Curve

The inverse relationship between price and quantity demanded for any product can be represented on a simple graph, in which, by convention, we measure *quantity demanded* on the horizontal axis and *price* on the vertical axis. In Figure 3.1 we have plotted the five price-quantity data points listed in the table and connected the points with a smooth curve, labeled *D*. This is a **demand curve**. Its downward slope reflects the law of demand: People buy more of a product, service, or resource as its price falls. They buy less as its price rises. There is an inverse relationship between price and quantity demanded.

The table and graph in Figure 3.1 contain exactly the same data and reflect the same inverse relationship between price and quantity demanded.

## Market Demand

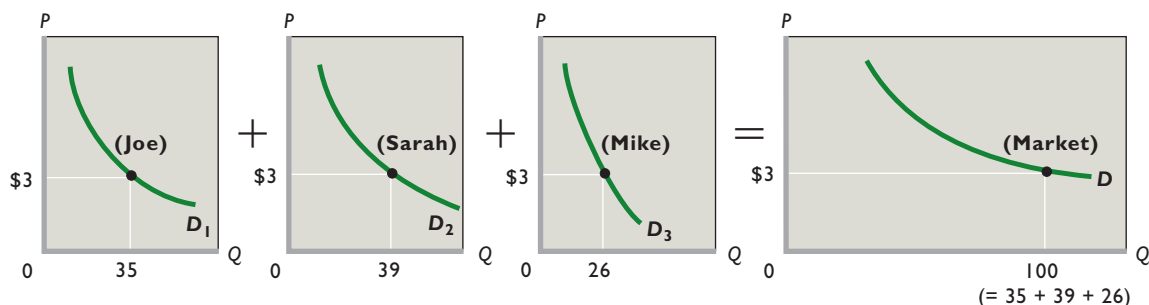
So far, we have concentrated on just one consumer, Joe Java. But competition requires that more than one buyer be present in each market. By adding the quantities demanded by all consumers at each of the various possible prices, we can get from *individual* demand to *market* demand. If there are just three buyers in the market (Joe Java, Sarah Coffee, and Mike Cappuccino), as represented by the table and graph in Figure 3.2, it is relatively easy to determine the total quantity demanded at each price. We simply sum the individual quantities demanded to obtain the total quantity demanded at each price. The particular price and the total quantity demanded are then plotted as one point on the market demand curve in Figure 3.2.

Competition, of course, ordinarily entails many more than three buyers of a product. To avoid hundreds or thousands of additions, let's simply suppose that the table and curve  $D_1$  in Figure 3.3 show the amounts all the buyers in this market will purchase at each of the five prices.

In constructing a demand curve such as  $D_1$  in Figure 3.3, economists assume that price is the most important influence on the amount of any product purchased. But economists know that other factors can and do affect purchases. These factors, called **determinants of demand**, are held constant when a demand curve like  $D_1$  is drawn. They are the “other things equal” in the relationship between price and quantity demanded. When any of these determinants changes, the demand curve will shift to the right or left. For this reason, determinants of demand are sometimes referred to as *demand shifters*.

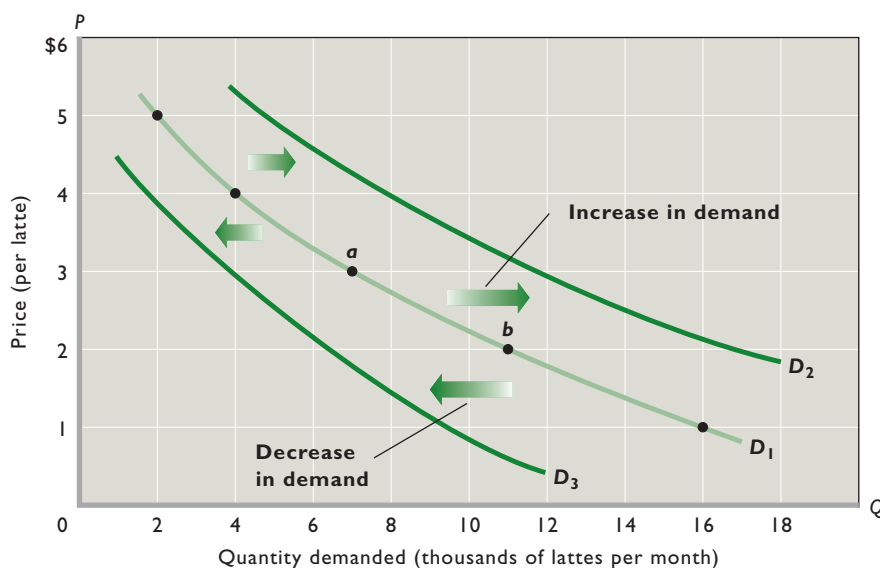
The basic determinants of demand are (1) consumers' tastes (preferences), (2) the number of consumers in the market, (3) consumers' incomes, (4) the prices of related goods, and (5) expected prices.

**FIGURE 3.2 Market demand for lattes, three buyers.** We establish the market demand curve  $D$  by adding horizontally the individual demand curves ( $D_1$ ,  $D_2$ , and  $D_3$ ) of all the consumers in the market. At the price of \$3, for example, the three individual curves yield a total quantity demanded of 100 lattes.



Market Demand for Lattes, Three Buyers							
Price per Latte	Quantity Demanded			=	Total Quantity Demanded per Month		
	Joe Java	Sarah Coffee	Mike Cappuccino				
\$5	10	+	12	+	8	=	30
4	20	+	23	+	17	=	60
3	35	+	39	+	26	=	100
2	55	+	60	+	39	=	154
1	80	+	87	+	54	=	221

**FIGURE 3.3 Changes in the demand for lattes.** A change in one or more of the determinants of demand causes a change in demand. An increase in demand is shown as a shift of the demand curve to the right, as from  $D_1$  to  $D_2$ . A decrease in demand is shown as a shift of the demand curve to the left, as from  $D_1$  to  $D_3$ . These changes in demand are to be distinguished from a change in *quantity demanded*, which is caused by a change in the price of the product, as shown by a movement from, say, point  $a$  to point  $b$  on fixed demand curve  $D_1$ .



Market Demand for Lattes ( $D$ )	
(1) Price per Latte	(2) Total Quantity Demanded per Month
\$5	2,000
4	4,000
3	7,000
2	11,000
1	16,000

## Changes in Demand

A change in one or more of the determinants of demand will change the underlying demand data (the demand schedule in the table) and therefore the location of the demand curve in Figure 3.3. A change in the demand schedule or, graphically, a shift in the demand curve is called a *change in demand*.

If consumers desire to buy more lattes at each possible price, that *increase in demand* is shown as a shift of the demand curve to the right, say, from  $D_1$  to  $D_2$ . Conversely, a *decrease in demand* occurs when consumers buy fewer lattes at each possible price. The leftward shift of the demand curve from  $D_1$  to  $D_3$  in Figure 3.3 shows that situation.

Now let's see how changes in each determinant affect demand.

**Tastes** A favorable change in consumer tastes (preferences) for a product means more of it will be demanded at each price. Demand will increase; the demand curve will shift rightward. For example, greater concern about the environment has increased the demand for hybrid cars and other “green” technologies. An unfavorable change in consumer preferences will decrease demand, shifting the demand curve to the left. For example, the recent popularity of low-carbohydrate diets has reduced the demand for bread and pasta.

**Number of Buyers** An increase in the number of buyers in a market increases product demand. For example, the rising number of older persons in the United States in recent years has increased the demand for motor homes and retirement communities. In contrast, the migration of people away from many small rural communities has reduced the demand for housing, home appliances, and auto repair in those towns.

**Income** The effect of changes in income on demand is more complex. For most products, a rise in income increases demand. Consumers collectively buy more airplane tickets, projection TVs, and gas grills as their incomes rise. Products whose demand increases or decreases *directly* with changes in income are called *superior goods*, or **normal goods**.

Although most products are normal goods, there are a few exceptions. As incomes increase beyond some point, the demand for used clothing, retread tires, and soy-enhanced hamburger may decline. Higher incomes enable consumers to buy new clothing, new tires, and higher-quality meats. Goods whose demand increases or decreases *inversely* with money income are called **inferior goods**. (This is an economic term; we are not making personal judgments on specific products.)

**Prices of Related Goods** A change in the price of a related good may either increase or decrease the demand for a product, depending on whether the related good is a substitute or a complement:

- A **substitute good** is one that can be used in place of another good.
- A **complementary good** is one that is used together with another good.

Beef and chicken are substitute goods or, simply, *substitutes*. When two products are substitutes, an increase in the price of one will increase the demand for the other. For example, when the price of beef rises, consumers will buy less beef and increase their demand for chicken. So it is with other product pairs such as Nikes and Reeboks, Budweiser and Miller beer, or Colgate and Crest toothpaste. They are *substitutes in consumption*.

### normal good

A good (or service) whose consumption rises when income increases and falls when income decreases.

### inferior good

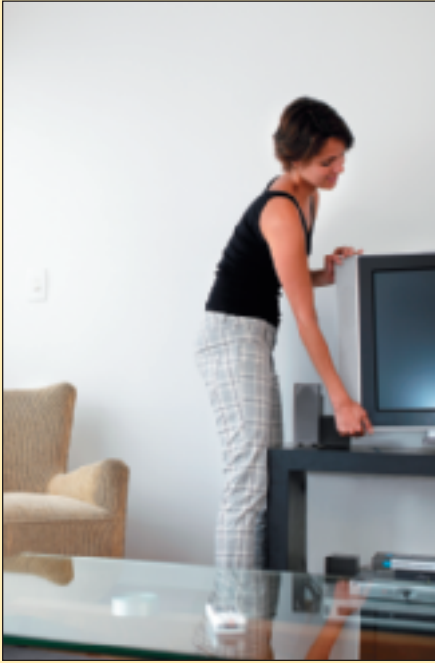
A good (or service) whose consumption declines when income rises and rises when income decreases.

### substitute good

A good (or service) that can be used in place of some other good (or service).

### complementary good

A good (or service) that is used in conjunction with some other good (or service).



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## PHOTO OP Normal versus Inferior Goods

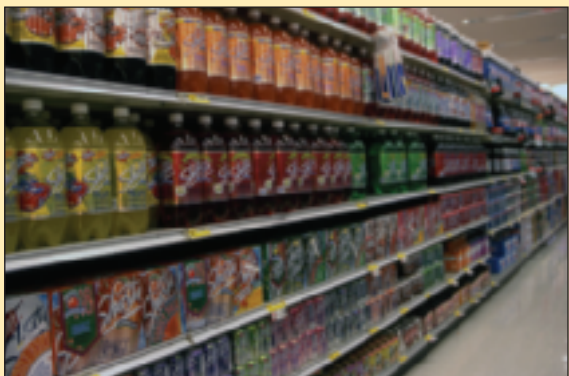
New television sets are normal goods. People buy more of them as their incomes rise. Hand-pushed lawn mowers are inferior goods. As incomes rise, people purchase gas-powered mowers instead.

Complementary goods (or, simply, *complements*) are products that are used together and thus are typically demanded jointly. Examples include computers and software, cell phones and cellular service, and snowboards and lift tickets. If the price of a complement (for example, lettuce) goes up, the demand for the related good (salad dressing) will decline. Conversely, if the price of a complement (for example, tuition) falls, the demand for a related good (textbooks) will increase.

The vast majority of goods that are unrelated to one another are called *independent goods*. There is virtually no demand relationship between bacon and golf balls or pickles and ice cream. A change in the price of one will have virtually no effect on the demand for the other.

**Expected Prices** Changes in expected prices may shift demand. A newly formed expectation of a higher price in the future may cause consumers to buy now in order to “beat” the anticipated price rise, thus increasing current demand. For example, when freezing weather destroys much of Brazil’s coffee crop, buyers may conclude that the price of coffee beans will rise. They may purchase large quantities now to stock up on beans. In contrast, a newly formed expectation of falling prices may decrease current demand for products.





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## PHOTO OP Substitutes versus Complements

Different brands of soft drinks are substitute goods; goods consumed jointly such as hot dogs and mustard are complementary goods.

## Changes in Quantity Demanded

### change in demand

A change in the quantity demanded of a product at every price; a shift of the demand curve to the left or right.

### change in quantity demanded

A movement from one point to another on a fixed demand curve.

### supply

A schedule or curve that shows the amounts of a product that producers are willing to make available for sale at each of a series of possible prices during a specific period.

Be sure not to confuse a *change in demand* with a *change in quantity demanded*. A **change in demand** is a shift of the demand curve to the right (an increase in demand) or to the left (a decrease in demand). It occurs because the consumer's state of mind about purchasing the product has been altered in response to a change in one or more of the determinants of demand. Recall that "demand" is a schedule or a curve; therefore, a "change in demand" means a change in the schedule and a shift of the curve.

In contrast, a **change in quantity demanded** is a movement from one point to another point—from one price-quantity combination to another—on a fixed demand curve. The cause of such a change is an increase or decrease in the price of the product under consideration. In the table in Figure 3.3, for example, a decline in the price of lattes from \$5 to \$4 will increase the quantity of lattes demanded from 2000 to 4000.

In the graph in Figure 3.3, the shift of the demand curve  $D_1$  to either  $D_2$  or  $D_3$  is a change in demand. But the movement from point  $a$  to point  $b$  on curve  $D_1$  represents a change in quantity demanded: Demand has not changed; it is the entire curve, and it remains fixed in place.

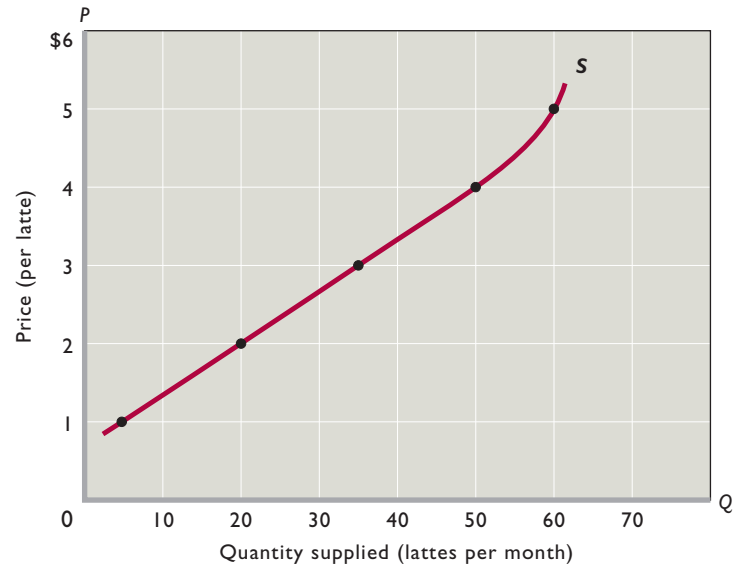
## Supply

**Supply** is a schedule or curve showing the amounts of a product that producers will make available for sale at each of a series of possible prices during a specific period.<sup>2</sup> The table in Figure 3.4 is a hypothetical supply schedule for Star Buck, a single supplier of lattes. Curve  $S$  incorporates the data in the table and is called a *supply curve*. The

<sup>2</sup>This definition is worded to apply to product markets. To adjust it to apply to resource markets, substitute "resource" for "product" and "owners" for "producers."

**FIGURE 3.4 Star Buck’s supply of lattes.** Because price and quantity supplied are directly related, the supply curve for an individual producer graphs as an upsloping curve. Other things equal, producers will offer more of a product for sale as its price rises and less of the product for sale as its price falls.

Star Buck’s Supply of Lattes	
Price per Latte	Quantity Supplied per Month
\$5	60
4	50
3	35
2	20
1	5



schedule and curve show the quantities of lattes that will be supplied at various prices, other things equal.

## Law of Supply

Figure 3.4 shows a positive or direct relationship that prevails between price and quantity supplied. As price rises, the quantity supplied rises; as price falls, the quantity supplied falls. This relationship is called the **law of supply**. A supply schedule or curve reveals that, other things equal, firms will offer for sale more of their product at a high price than at a low price. This, again, is basically common sense.

Price is an obstacle from the standpoint of the consumer (for example, Joe Java), who is on the paying end. The higher the price, the less the consumer will buy. But the supplier (for example, Star Buck) is on the receiving end of the product’s price. To a supplier, price represents *revenue*, which is needed to cover costs and earn a profit. Higher prices therefore create a profit incentive to produce and sell more of a product. The higher the price, the greater this incentive and the greater the quantity supplied.

### law of supply

The principle that, other things equal, as price rises, the quantity supplied rises, and as price falls, the quantity supplied falls.

## Market Supply

Market supply is derived from individual supply in exactly the same way that market demand is derived from individual demand (Figure 3.2). We sum (not shown) the quantities supplied by each producer at each price. That is, we obtain the market **supply curve** by “horizontally adding” (also not shown) the supply curves of the individual producers. The price and quantity-supplied data in the table in Figure 3.5 are for an assumed 200 identical producers in the market, each willing to supply lattes according to the supply schedule shown in Figure 3.4. Curve  $S_1$  is a graph of the market supply data. Note that the axes in Figure 3.5 are the same as those used in our

### supply curve

A curve illustrating the direct relationship between the price of a product and the quantity of it supplied, other things equal.



graph of market demand (Figure 3.3). The only difference is that we change the label on the horizontal axis from “quantity demanded” to “quantity supplied.”

## Determinants of Supply

In constructing a supply curve, we assume that price is the most significant influence on the quantity supplied of any product. But other factors (the “other things equal”) can and do affect supply. The supply curve is drawn on the assumption that these other things are fixed and do not change. If one of them does change, a *change in supply* will occur, meaning that the entire supply curve will shift.

**determinants of supply**  
Factors other than price that locate the position of the supply curve.

The basic **determinants of supply** are (1) resource prices, (2) technology, (3) taxes and subsidies, (4) prices of other goods, (5) expected price, and (6) the number of sellers in the market. A change in any one or more of these determinants of supply, or *supply shifters*, will move the supply curve for a product either right or left. A shift to the *right*, as from  $S_1$  to  $S_2$  in Figure 3.5, signifies an *increase* in supply: Producers supply larger quantities of the product at each possible price. A shift to the *left*, as from  $S_1$  to  $S_3$ , indicates a *decrease* in supply: Producers offer less output at each price.

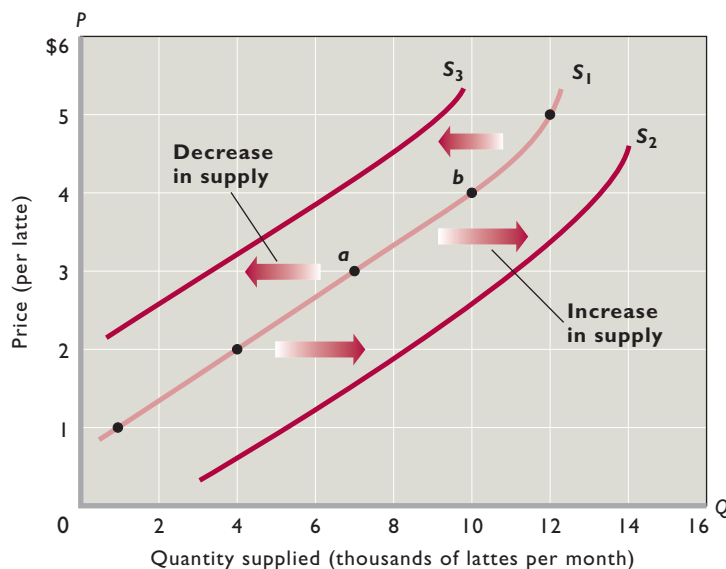
## Changes in Supply

Let’s consider how changes in each of the determinants affect supply. The key idea is that costs are a major factor underlying supply curves; anything that affects costs (other than changes in output itself) usually shifts the supply curve.

**Resource Prices** The prices of the resources used in the production process help determine the costs of production incurred by firms. Higher *resource* prices raise production costs and, assuming a particular *product* price, squeeze profits. That reduction

**FIGURE 3.5 Changes in the supply of lattes.** A change in one or more of the determinants of supply causes a change in supply. An increase in supply is shown as a rightward shift of the supply curve, as from  $S_1$  to  $S_2$ . A decrease in supply is depicted as a leftward shift of the curve, as from  $S_1$  to  $S_3$ . In contrast, a change in the *quantity supplied* is caused by a change in the product’s price and is shown by a movement from one point to another, as from *a* to *b* on fixed supply curve  $S_1$ .

Market Supply of Lattes ( $S_1$ )	
(1) Price per Latte	(2) Total Quantity Supplied per Month
\$5	12,000
4	10,000
3	7,000
2	4,000
1	1,000



in profits reduces the incentive for firms to supply output at each product price. For example, an increase in the prices of coffee beans and milk will increase the cost of making lattes and therefore reduce their supply.

In contrast, lower *resource* prices reduce production costs and increase profits. So when resource prices fall, firms supply greater output at each product price. For example, a decrease in the prices of sand, gravel, and limestone will increase the supply of concrete.

**Technology** Improvements in technology (techniques of production) enable firms to produce units of output with fewer resources. Because resources are costly, using fewer of them lowers production costs and increases supply. Example: Technological advances in producing flat-panel computer monitors have greatly reduced their cost. Thus, manufacturers will now offer more such monitors than previously at the various prices; the supply of flat-panel monitors has increased.

**Taxes and Subsidies** Businesses treat sales and property taxes as costs. Increases in those taxes will increase production costs and reduce supply. In contrast, subsidies are “taxes in reverse.” If the government subsidizes the production of a good, it in effect lowers the producers’ costs and increases supply.

**Prices of Other Goods** Firms that produce a particular product, say, soccer balls, can usually use their plant and equipment to produce alternative goods, say, basketballs and volleyballs. The higher prices of these “other goods” may entice soccer ball producers to switch production to those other goods in order to increase profits. This *substitution in production* results in a decline in the supply of soccer balls. Alternatively, when basketballs and volleyballs decline in price relative to the price of soccer balls, firms will produce fewer of those products and more soccer balls, increasing the supply of soccer balls.

**Expected Prices** Changes in expectations about the future price of a product may affect the producer’s current willingness to supply that product. It is difficult, however, to generalize about how a new expectation of higher prices affects the present supply of a product. Farmers anticipating a higher wheat price in the future might withhold some of their current wheat harvest from the market, thereby causing a decrease in the current supply of wheat. In contrast, in many types of manufacturing industries, newly formed expectations that price will increase may induce firms to add another shift of workers or to expand their production facilities, causing current supply to increase.

**Number of Sellers** Other things equal, the larger the number of suppliers, the greater the market supply. As more firms enter an industry, the supply curve shifts to the right. Conversely, the smaller the number of firms in the industry, the less the market supply. This means that as firms leave an industry, the supply curve shifts to the left. Example: The United States and Canada have imposed restrictions on haddock fishing to replenish dwindling stocks. As part of that policy, the federal government has bought the boats of some of the haddock fishers as a way of putting them out of business and decreasing the catch. The result has been a decline in the market supply of haddock.

## Changes in Quantity Supplied

The distinction between a *change in supply* and a *change in quantity supplied* parallels the distinction between a change in demand and a change in quantity demanded. Because

**change in supply**

A change in the quantity supplied of a product at every price; a shift of the supply curve to the left or right.

**change in quantity supplied**

A movement from one point to another on a fixed supply curve.

**equilibrium price**

The price in a competitive market at which the quantity demanded and quantity supplied of a product are equal.

**equilibrium quantity**

The quantity demanded and quantity supplied that occur at the equilibrium price in a competitive market.

**surplus**

The amount by which the quantity supplied of a product exceeds the quantity demanded at a specific (above-equilibrium) price.

supply is a schedule or curve, a **change in supply** means a change in the schedule and a shift of the curve. An increase in supply shifts the curve to the right; a decrease in supply shifts it to the left. The cause of a change in supply is a change in one or more of the determinants of supply.

In contrast, a **change in quantity supplied** is a movement from one point to another on a fixed supply curve. The cause of such a movement is a change in the price of the specific product being considered. In Figure 3.5, a decline in the price of lattes from \$4 to \$3 decreases the quantity of lattes supplied per month from 10,000 to 7000. This movement from point *b* to point *a* along  $S_1$  is a change in quantity supplied, not a change in supply. Supply is the full schedule of prices and quantities shown, and this schedule does not change when the price of lattes changes.

## Market Equilibrium

With our understanding of demand and supply, we can now show how the decisions of Joe Java and other buyers of lattes interact with the decisions of Star Buck and other sellers to determine the price and quantity of lattes. In the table in Figure 3.6, columns 1 and 2 repeat the market supply of lattes (from Figure 3.5), and columns 2 and 3 repeat the market demand for lattes (from Figure 3.3). We assume this is a competitive market, so neither buyers nor sellers can set the price.

### Equilibrium Price and Quantity

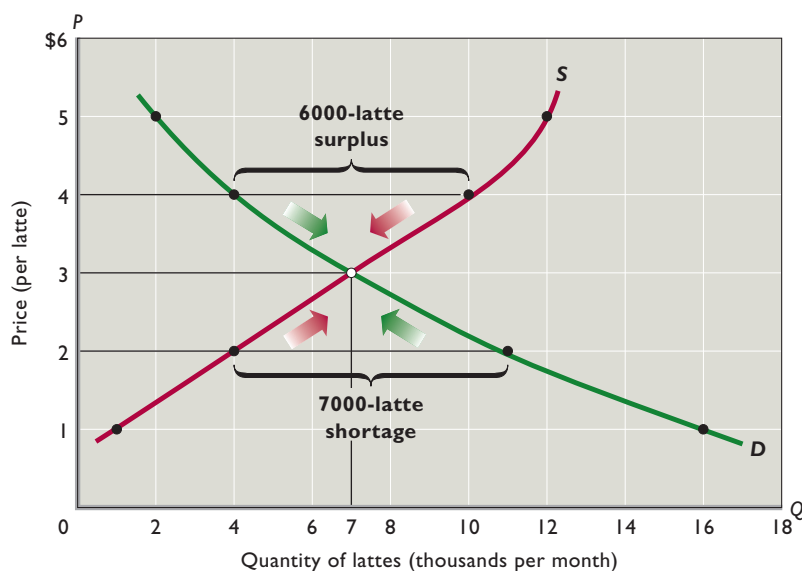
We are looking for the equilibrium price and equilibrium quantity. The **equilibrium price** (or *market-clearing price*) is the price at which the intentions of buyers and sellers match. It is the price at which quantity demanded equals quantity supplied. The table in Figure 3.6 reveals that at \$3, *and only at that price*, the number of lattes that sellers wish to sell (7000) is identical to the number that consumers want to buy (also 7000). At \$3 and 7000 lattes, there is neither a shortage nor a surplus of lattes. So 7000 lattes is the **equilibrium quantity**: the quantity at which the intentions of buyers and sellers match so that the quantity demanded and the quantity supplied are equal.

Graphically, the equilibrium price is indicated by the intersection of the supply curve and the demand curve in Figure 3.6. (The horizontal axis now measures both quantity demanded and quantity supplied.) With neither a shortage nor a surplus at \$3, the market is *in equilibrium*, meaning “in balance” or “at rest.”

To better understand the uniqueness of the equilibrium price, let’s consider other prices. At any above-equilibrium price, quantity supplied exceeds quantity demanded. For example, at the \$4 price, sellers will offer 10,000 lattes, but buyers will purchase only 4000. The \$4 price encourages sellers to offer lots of lattes but discourages many consumers from buying them. The result is a **surplus** or *excess supply* of 6000 lattes. If latte sellers made them all, they would find themselves with 6000 unsold lattes.

Surpluses drive prices down. Even if the \$4 price existed temporarily, it could not persist. The large surplus would prompt competing sellers to lower the price to encourage buyers to stop in and take the surplus off their hands. As the price fell, the incentive to produce lattes would decline and the incentive for consumers to buy lattes would increase. As shown in Figure 3.6, the market would move to its equilibrium at \$3.

Any price below the \$3 equilibrium price would create a shortage; quantity demanded would exceed quantity supplied. Consider a \$2 price, for example. We see in column 4 of the table in Figure 3.6 that quantity demanded exceeds quantity



**FIGURE 3.6** Equilibrium price and quantity.

The intersection of the downsloping demand curve  $D$  and the upsloping supply curve  $S$  indicates the equilibrium price and quantity, here \$3 and 7,000 lattes. The shortages of lattes at below-equilibrium prices (for example, 7,000 at \$2) drive up price. The higher prices increase the quantity supplied and reduce the quantity demanded until equilibrium is achieved. The surpluses caused by above-equilibrium prices (for example, 6,000 lattes at \$4) push price down. As price drops, the quantity demanded rises and the quantity supplied falls until equilibrium is established. At the equilibrium price and quantity, there are neither shortages nor surpluses of lattes.

Market Supply of and Demand for Lattes			
(1) Total Quantity Supplied per Month	(2) Price per Latte	(3) Total Quantity Demanded per Month	(4) Surplus (+) or Shortage (-)*
12,000	\$5	2,000	+10,000 ↓
10,000	4	4,000	+6,000 ↓
<b>7,000</b>	<b>3</b>	<b>7,000</b>	<b>0</b>
4,000	2	11,000	-7,000 ↑
1,000	1	16,000	-15,000 ↑

\*Arrows indicate the effect on price.

supplied at that price. The result is a **shortage** or *excess demand* of 7,000 lattes. The \$2 price discourages sellers from devoting resources to lattes and encourages consumers to desire more lattes than are available. The \$2 price cannot persist as the equilibrium price. Many consumers who want to buy lattes at this price will not obtain them. They will express a willingness to pay more than \$2 to get them. Competition among these buyers will drive up the price, eventually to the \$3 equilibrium level. Unless disrupted by supply or demand changes, this \$3 price of lattes will continue.

## Rationing Function of Prices

The ability of the competitive forces of supply and demand to establish a price at which selling and buying decisions are consistent is called the *rationing function of prices*. In our case, the equilibrium price of \$3 clears the market, leaving no

### shortage

The amount by which the quantity demanded of a product exceeds the quantity supplied at a specific (below-equilibrium) price.

## INTERACTIVE GRAPHS

## G 3.1

Supply and demand

burdensome surplus for sellers and no inconvenient shortage for potential buyers. And it is the combination of freely made individual decisions that sets this market-clearing price. In effect, the market outcome says that all buyers who are willing and able to pay \$3 for a latte will obtain one; all buyers who cannot or will not pay \$3 will go without one. Similarly, all producers who are willing and able to offer a latte for sale at \$3 will sell it; all producers who cannot or will not sell for \$3 will not sell their product.

## APPLYING THE ANALYSIS



## Ticket Scalping

Ticket prices for athletic events and musical concerts are usually set far in advance of the events. Sometimes the original ticket price is too low to be the equilibrium price. Lines form at the ticket window, and a severe shortage of tickets occurs at the printed price. What happens next? Buyers who are willing to pay more than the original price bid up the equilibrium price in resale ticket markets. The price rockets upward.

Tickets sometimes get resold for much greater amounts than the original price—market transactions known as “scalping.” For example, an original buyer may resell a \$75 ticket to a concert for \$200. The media sometimes denounce scalpers for “ripping off” buyers by charging “exorbitant” prices.

But is scalping really a rip-off? We must first recognize that such ticket resales are voluntary transactions. If both buyer and seller did not expect to gain from the exchange, it would not occur! The seller must value the \$200 more than seeing the event, and the buyer must value seeing the event at \$200 or more. So there are no losers or victims here: Both buyer and seller benefit from the transaction. The “scalping” market simply redistributes assets (game or concert tickets) from those who would rather have the money (other things) to those who would rather have the tickets.

Does scalping impose losses or injury on the sponsors of the event? If the sponsors are injured, it is because they initially priced tickets below the equilibrium level. Perhaps they did this to create a long waiting line and the attendant media publicity. Alternatively, they may have had a genuine desire to keep tickets affordable for lower-income, ardent fans. In either case, the event sponsors suffer an opportunity cost in the form of less ticket revenue than they might have otherwise received. But such losses are self-inflicted and quite separate and distinct from the fact that some tickets are later resold at a higher price.

So is ticket scalping undesirable? Not on economic grounds! It is an entirely voluntary activity that benefits both sellers and buyers.

**QUESTION: Why do you suppose some professional sports teams are setting up legal “ticket exchanges” (at buyer- and seller-determined prices) at their Internet sites? (Hint: For the service, the teams charge a percentage of the transaction price of each resold ticket.)**

## Changes in Demand, Supply, and Equilibrium

We know that prices can and do change in markets. For example, demand might change because of fluctuations in consumer tastes or incomes, changes in expected price, or variations in the prices of related goods. Supply might change in response to changes in resource prices, technology, or taxes. How will such changes in demand and supply affect equilibrium price and quantity?

### Changes in Demand

Suppose that the supply of some good (for example, health care) is constant and the demand for the good increases, as shown in Figure 3.7a. As a result, the new intersection of the supply and demand curves is at higher values on both the price and the quantity axes. Clearly, an increase in demand raises both equilibrium price and equilibrium quantity. Conversely, a decrease in demand, such as that shown in Figure 3.7b, reduces both equilibrium price and equilibrium quantity.

### Changes in Supply

What happens if the demand for some good (for example, cell phones) is constant but the supply increases, as in Figure 3.7c? The new intersection of supply and demand is located at a lower equilibrium price but at a higher equilibrium quantity. An increase in supply reduces equilibrium price but increases equilibrium quantity. In contrast, if supply decreases, as in Figure 3.7d, equilibrium price rises while equilibrium quantity declines.

### Complex Cases

When both supply and demand change, the effect is a combination of the individual effects.

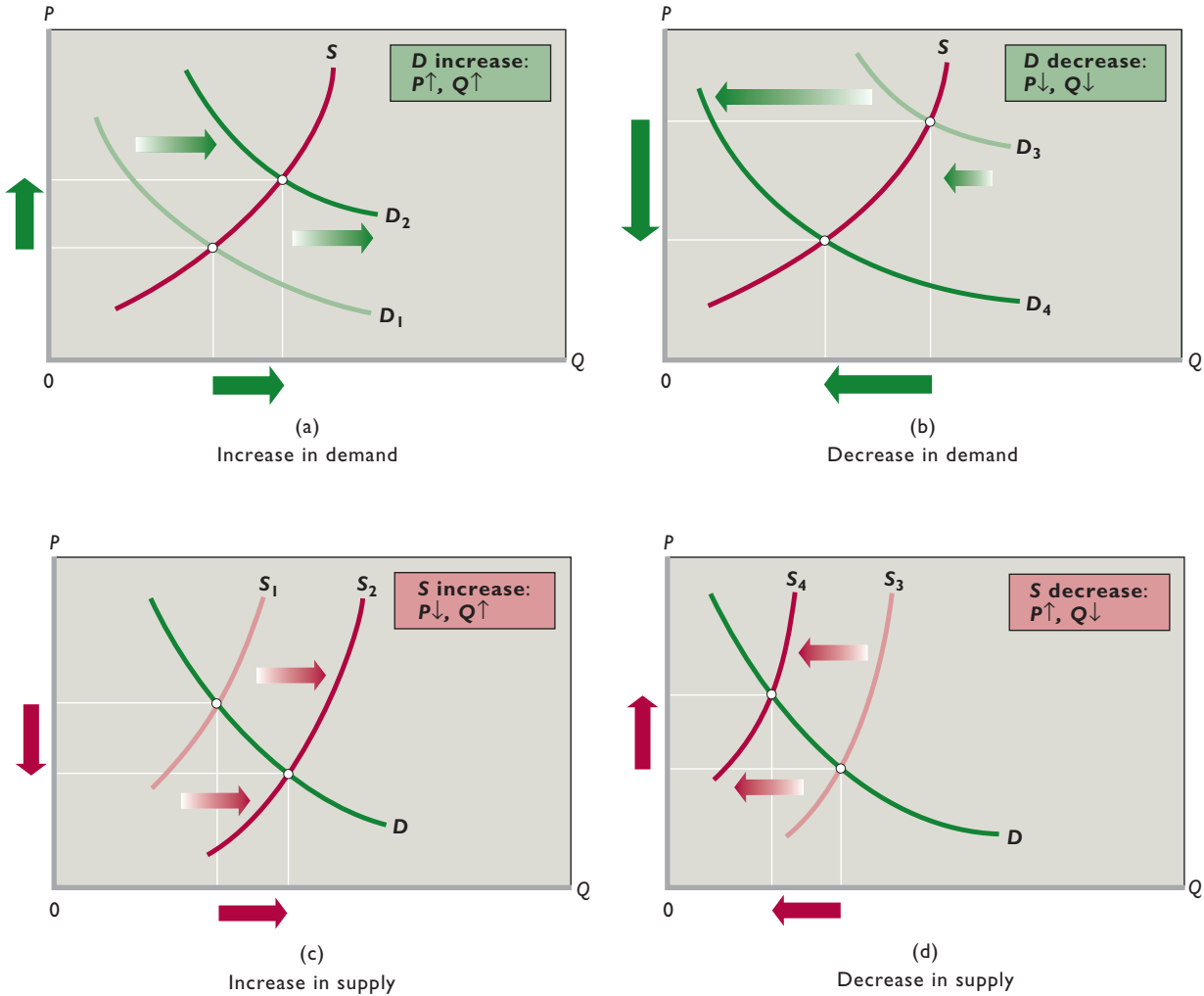
**Supply Increase; Demand Decrease** What effect will a supply increase for some good (for example, apples) and a demand decrease have on equilibrium price? Both changes decrease price, so the net result is a price drop greater than that resulting from either change alone.

What about equilibrium quantity? Here the effects of the changes in supply and demand are opposed: The increase in supply increases equilibrium quantity, but the decrease in demand reduces it. The direction of the change in equilibrium quantity depends on the relative sizes of the changes in supply and demand. If the increase in supply is larger than the decrease in demand, the equilibrium quantity will increase. But if the decrease in demand is greater than the increase in supply, the equilibrium quantity will decrease.

**Supply Decrease; Demand Increase** A decrease in supply and an increase in demand for some good (for example, gasoline) both increase price. Their combined effect is an increase in equilibrium price greater than that caused by either change separately. But their effect on the equilibrium quantity is again indeterminate, depending on the relative sizes of the changes in supply and demand. If the decrease in supply is larger than the increase in demand, the equilibrium quantity will decrease. In contrast, if the increase in demand is greater than the decrease in supply, the equilibrium quantity will increase.



**FIGURE 3.7 Changes in demand and supply and the effects on price and quantity.** The increase in demand from  $D_1$  to  $D_2$  in (a) increases both equilibrium price and equilibrium quantity. The decrease in demand from  $D_3$  to  $D_4$  in (b) decreases both equilibrium price and equilibrium quantity. The increase in supply from  $S_1$  to  $S_2$  in (c) decreases equilibrium price and increases equilibrium quantity. The decrease in supply from  $S_3$  to  $S_4$  in (d) increases equilibrium price and decreases equilibrium quantity. The boxes in the top right summarize the respective changes and outcomes. The upward arrows in the boxes signify increases in equilibrium price ( $P$ ) and equilibrium quantity ( $Q$ ); the downward arrows signify decreases in these items.



**Supply Increase; Demand Increase** What if supply and demand both increase for some good (for example, sushi)? A supply increase drops equilibrium price, while a demand increase boosts it. If the increase in supply is greater than the increase in demand, the equilibrium price will fall. If the opposite holds, the equilibrium price will rise. If the two changes are equal and cancel out, price will not change.

The effect on equilibrium quantity is certain: The increases in supply and in demand both raise the equilibrium quantity. Therefore, the equilibrium quantity will increase by an amount greater than that caused by either change alone.

**Supply Decrease; Demand Decrease** What about decreases in both supply and demand for some good (for example, new homes)? If the decrease in supply is greater

than the decrease in demand, equilibrium price will rise. If the reverse is true, equilibrium price will fall. If the two changes are of the same size and cancel out, price will not change. Because the decreases in supply and demand both reduce equilibrium quantity, we can be sure that equilibrium quantity will fall.

## Government-Set Prices

In most markets, prices are free to rise or fall with changes in supply or demand, no matter how high or low those prices might be. However, government occasionally concludes that changes in supply and demand have created prices that are unfairly high to buyers or unfairly low to sellers. Government may then place legal limits on how high or low a price or prices may go. Our previous analysis of shortages and surpluses helps us evaluate the wisdom of government-set prices.

### Price Ceilings on Gasoline

A **price ceiling** sets the maximum legal price a seller may charge for a product or service. A price at or below the ceiling is legal; a price above it is not. The rationale for establishing price ceilings (or ceiling prices) on specific products is that they purportedly enable consumers to obtain some “essential” good or service that they could not afford at the equilibrium price.

Figure 3.8 shows the effects of price ceilings graphically. Let’s look at a hypothetical situation. Suppose that rapidly rising world income boosts the purchase of automobiles and increases the demand for gasoline so that the equilibrium or market price reaches \$3.50 per gallon. The rapidly rising price of gasoline greatly burdens low- and moderate-income households, which pressure government to “do something.” To keep gasoline prices down, the government imposes a ceiling price of \$3 per gallon. To impact the market, a price ceiling must be below the equilibrium price. A ceiling price of \$4, for example, would have no effect on the price of gasoline in the current situation.

What are the effects of this \$3 ceiling price? The rationing ability of the free market is rendered ineffective. Because the \$3 ceiling price is below the \$3.50 market-clearing price, there is a lasting shortage of gasoline. The quantity of gasoline demanded at \$3 is  $Q_d$  and the quantity supplied is only  $Q_s$ ; a persistent excess demand or shortage of amount  $Q_d - Q_s$  occurs.

The \$3 price ceiling prevents the usual market adjustment in which competition among buyers bids up the price, inducing more production and rationing some buyers out of the market. That process would normally continue until the shortage disappeared at the equilibrium price and quantity, \$3.50 and  $Q_0$ .

How will sellers apportion the available supply  $Q_s$  among buyers, who want the greater amount  $Q_d$ ? Should they distribute gasoline on a first-come, first-served basis, that is, to those willing and able to get in line the soonest or stay in line the longest? Or should gas stations distribute it on the basis of favoritism? Since an unregulated shortage does not lead to an equitable distribution of gasoline, the government must establish some formal system for rationing it to consumers. One option is to issue ration coupons, which authorize bearers to purchase a fixed amount of gasoline per

### APPLYING THE ANALYSIS

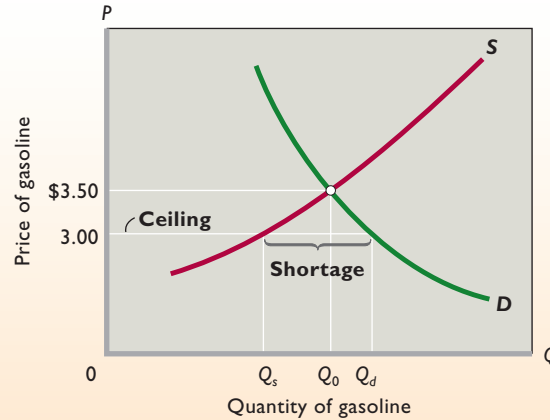


#### price ceiling

A legally established maximum (below-equilibrium) price for a product.

**FIGURE 3.8 A price ceiling.**

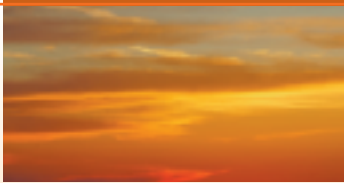
A price ceiling is a maximum legal price, such as \$3, that is below the equilibrium price. It results in a persistent product shortage, here shown by the distance between  $Q_d$  and  $Q_s$ .



month. The rationing system might entail first the printing of coupons for  $Q_s$  gallons of gasoline and then the equal distribution of the coupons among consumers so that the wealthy family of four and the poor family of four both receive the same number of coupons.

But ration coupons would not prevent a second problem from arising. The demand curve in Figure 3.8 reveals that many buyers are willing to pay more than the \$3 ceiling price. And, of course, it is more profitable for gasoline stations to sell at prices above the ceiling. Thus, despite a sizable enforcement bureaucracy that would have to accompany the price controls, *black markets* in which gasoline is illegally bought and sold at prices above the legal limits will flourish. Counterfeiting of ration coupons will also be a problem. And since the price of gasoline is now “set by government,” there might be political pressure on government to set the price even lower.

**QUESTION: Why is it typically difficult to end price ceilings once they have been in place for a long time?**

**APPLYING THE ANALYSIS****Rent Controls**

About 200 cities in the United States, including New York City, Boston, and San Francisco, have at one time or another enacted price ceilings in the form of rent controls—maximum rents established by law—or, more recently, have set maximum rent increases for existing tenants. Such laws are well intended. Their goals are to protect low-income families from escalating rents caused by demand increases that outstrip supply increases. Rent controls are designed to alleviate perceived housing shortages and make housing more affordable.

What have been the actual economic effects? On the demand side, the below-equilibrium rents attract a larger number of renters. Some are locals seeking to

move into their own places after sharing housing with friends or family. Others are outsiders attracted into the area by the artificially lower rents. But a large problem occurs on the supply side. Price controls make it less attractive for landlords to offer housing on the rental market. In the short run, owners may sell their rental units or convert them to condominiums. In the long run, low rents make it unprofitable for owners to repair or renovate their rental units. (Rent controls are one cause of the many abandoned apartment buildings found in some larger cities.) Also, insurance companies, pension funds, and other potential new investors in housing will find it more profitable to invest in office buildings, shopping malls, or motels, where rents are not controlled.

In brief, rent controls distort market signals, and thus resources are misallocated: Too few resources are allocated to rental housing, and too many to alternative uses. Ironically, although rent controls are often legislated to lessen the effects of perceived shortages, controls in fact are a primary cause of such shortages. For that reason, most American cities either have abandoned rent controls or are gradually phasing them out.

**QUESTION: Why does maintenance tend to diminish in rent-controlled apartment buildings relative to maintenance in buildings where owners can charge market-determined rents?**

## Price Floors on Wheat

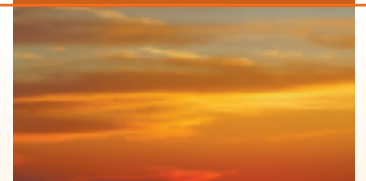
A **price floor** is a minimum price fixed by the government. A price at or above the price floor is legal; a price below it is not. Price floors above equilibrium prices are usually invoked when society feels that the free functioning of the market system has not provided a sufficient income for certain groups of resource suppliers or producers. Supported prices for agricultural products and current minimum wages are two examples of price (or wage) floors. Let's look at the former.

Suppose that many farmers have extremely low incomes when the price of wheat is at its equilibrium value of \$2 per bushel. The government decides to help out by establishing a legal price floor (or "price support") of \$3 per bushel.

What will be the effects? At any price above the equilibrium price, quantity supplied will exceed quantity demanded—that is, there will be a persistent surplus of the product. Farmers will be willing to produce and offer for sale more wheat than private buyers are willing to buy at the \$3 price floor. As we saw with a price ceiling, an imposed legal price disrupts the rationing ability of the free market.

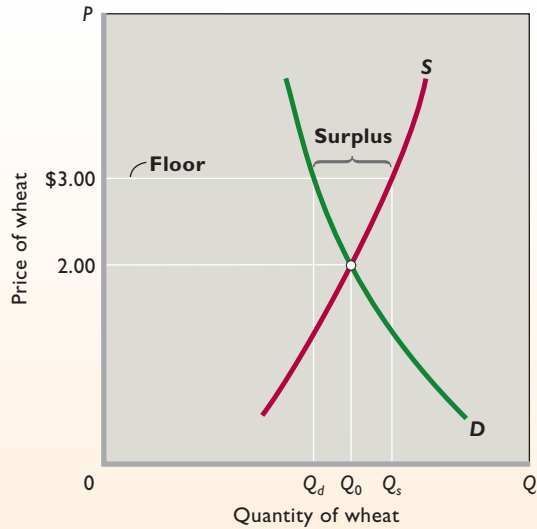
Figure 3.9 illustrates the effect of a price floor graphically. Suppose that  $S$  and  $D$  are the supply and demand curves for wheat. Equilibrium price and quantity are \$2 and  $Q_0$ , respectively. If the government imposes a price floor of \$3, farmers will produce  $Q_s$  but private buyers will purchase only  $Q_d$ . The surplus is the excess of  $Q_s$  over  $Q_d$ .

### APPLYING THE ANALYSIS



**price floor**  
A legally established minimum (above-equilibrium) price for a product.

**FIGURE 3.9 A price floor.** A price floor is a minimum legal price, such as \$3, that results in a persistent product surplus, here shown by the distance between  $Q_s$  and  $Q_d$ .



The government may cope with the surplus resulting from a price floor in two ways:

- It can restrict supply (for example, by instituting acreage allotments by which farmers agree to take a certain amount of land out of production) or increase demand (for example, by researching new uses for the product involved). These actions may reduce the difference between the equilibrium price and the price floor and that way reduce the size of the resulting surplus.
- If these efforts are not wholly successful, then the government must purchase the surplus output at the \$3 price (thereby subsidizing farmers) and store or otherwise dispose of it.

Price floors such as \$3 in Figure 3.9 not only disrupt the rationing ability of prices but also distort resource allocation. Without the price floor, the \$2 equilibrium price of wheat would cause financial losses and force high-cost wheat producers to plant other crops or abandon farming altogether. But the \$3 price floor allows them to continue to grow wheat and remain farmers. So society devotes too many scarce resources to wheat production and too few to producing other, more valuable, goods and services. It fails to achieve an optimal allocation of resources.

That's not all. Consumers of wheat-based products pay higher prices because of the price floor. Taxpayers pay higher taxes to finance the government's purchase of the surplus. Also, the price floor causes potential environmental damage by encouraging wheat farmers to bring hilly, erosion-prone "marginal land" into production. The higher price also prompts imports of wheat. But, since such imports would increase the quantity of wheat supplied and thus undermine the price floor, the government needs to erect tariffs (taxes on imports) to keep the foreign wheat out. Such tariffs usually prompt other countries to retaliate with their own tariffs against U.S. agricultural or manufacturing exports.

**QUESTION:** To maintain price floors on milk, the U.S. government has at times bought out and destroyed entire dairy herds from dairy farmers. What's the economic logic of these actions?

It is easy to see why economists “sound the alarm” when politicians advocate imposing price ceilings or price floors such as price controls, rent controls, interest-rate lids, or agricultural price supports. In all these cases, good intentions lead to bad economic outcomes. Government-controlled prices lead to shortages or surpluses, distort resource allocations, and cause negative side effects.

*For additional examples of demand and supply, view the Chapter 3 Web appendix at [www.mcconnellbrief2e.com](http://www.mcconnellbrief2e.com). There, you will find examples relating to such diverse products as lettuce, corn, salmon, gasoline, sushi, and Olympic tickets. Several of the examples depict simultaneous shifts in demand and supply curves—circumstances that often show up in exam questions!*

## INTERACTIVE GRAPHS

### G 3.2

#### Price floors and ceilings

## Summary

1. Demand is a schedule or curve representing the willingness of buyers in a specific period to purchase a particular product at each of various prices. The law of demand implies that consumers will buy more of a product at a low price than at a high price. So, other things equal, the relationship between price and quantity demanded is inverse and is graphed as a downsloping curve.
2. Market demand curves are found by adding horizontally the demand curves of the many individual consumers in the market.
3. Changes in one or more of the determinants of demand (consumer tastes, the number of buyers in the market, the money incomes of consumers, the prices of related goods, and expected prices) shift the market demand curve. A shift to the right is an increase in demand; a shift to the left is a decrease in demand. A change in demand is different from a change in the quantity demanded, the latter being a movement from one point to another point on a fixed demand curve because of a change in the product's price.
4. Supply is a schedule or curve showing the amounts of a product that producers are willing to offer in the market at each possible price during a specific period. The law of supply states that, other things equal, producers will offer more of a product at a high price than at a low price. Thus, the relationship between price and quantity supplied is positive or direct, and supply is graphed as an upsloping curve.
5. The market supply curve is the horizontal summation of the supply curves of the individual producers of the product.
6. Changes in one or more of the determinants of supply (resource prices, production techniques, taxes or subsidies, the prices of other goods, expected prices, or the number of suppliers in the market) shift the supply curve of a product. A shift to the right is an increase in supply; a shift to the left is a decrease in supply. In contrast, a change in the price of the product being considered causes a change in the quantity supplied, which is shown as a movement from one point to another point on a fixed supply curve.
7. The equilibrium price and quantity are established at the intersection of the supply and demand curves. The interaction of market demand and market supply adjusts the price to the point at which the quantities demanded and supplied are equal. This is the equilibrium price. The corresponding quantity is the equilibrium quantity.
8. A change in either demand or supply changes the equilibrium price and quantity. Increases in demand raise both equilibrium price and equilibrium quantity; decreases in demand lower both equilibrium price and equilibrium quantity. Increases in supply lower equilibrium price and raise equilibrium quantity; decreases in supply raise equilibrium price and lower equilibrium quantity.
9. Simultaneous changes in demand and supply affect equilibrium price and quantity in various ways, depending on their direction and relative magnitudes.
10. A price ceiling is a maximum price set by government and is designed to help consumers. Effective price ceilings produce persistent product shortages, and if an equitable distribution of the product is sought, government must ration the product to consumers.
11. A price floor is a minimum price set by government and is designed to aid producers. Price floors lead to persistent product surpluses; the government must either purchase the product or eliminate the surplus by imposing restrictions on production or increasing private demand.
12. Legally fixed prices stifle the rationing function of prices and distort the allocation of resources.



## Terms and Concepts

demand	change in demand	change in quantity supplied
law of demand	change in quantity demanded	equilibrium price
demand curve	supply	equilibrium quantity
determinants of demand	law of supply	surplus
normal good	supply curve	shortage
inferior good	determinants of supply	price ceiling
substitute good	change in supply	price floor
complementary good		

## Questions

- Explain the law of demand. Why does a demand curve slope downward? How is a market demand curve derived from individual demand curves? **LO1**
- What are the determinants of demand? What happens to the demand curve when any of these determinants changes? Distinguish between a change in demand and a change in the quantity demanded, noting the cause(s) of each. **LO1**
- What effect will each of the following have on the demand for small automobiles such as the Mini Cooper and Smart car? **LO1**
  - Small automobiles become more fashionable.
  - The price of large automobiles rises (with the price of small autos remaining the same).
  - Income declines and small autos are an inferior good.
  - Consumers anticipate that the price of small autos will greatly come down in the near future.
  - The price of gasoline substantially drops.
- Explain the law of supply. Why does the supply curve slope upward? How is the market supply curve derived from the supply curves of individual producers? **LO2**
- What are the determinants of supply? What happens to the supply curve when any of these determinants changes? Distinguish between a change in supply and a change in the quantity supplied, noting the cause(s) of each. **LO2**
- What effect will each of the following have on the supply of auto tires? **LO2**
  - A technological advance in the methods of producing tires.
  - A decline in the number of firms in the tire industry.
  - An increase in the price of rubber used in the production of tires.
  - The expectation that the equilibrium price of auto tires will be lower in the future than currently.
  - A decline in the price of the large tires used for semi trucks and earth-hauling rigs (with no change in the price of auto tires).
  - The levying of a per-unit tax on each auto tire sold.
  - The granting of a 50-cent-per-unit subsidy for each auto tire produced.
- “In the latte market, demand often exceeds supply and supply sometimes exceeds demand.” “The price of a latte rises and falls in response to changes in supply and demand.” In which of these two statements are the concepts of supply and demand used correctly? Explain. **LO4**
- In 2001 an outbreak of hoof-and-mouth disease in Europe led to the burning of millions of cattle carcasses. What impact do you think this had on the supply of cattle hides, hide prices, the supply of leather goods, and the price of leather goods? **LO4**
- Critically evaluate: “In comparing the two equilibrium positions in Figure 3.7a, I note that a larger amount is actually demanded at a higher price. This refutes the law of demand.” **LO4**
- For each stock in the stock market, the number of shares sold daily equals the number of shares purchased. That is, the quantity of each firm’s shares demanded equals the quantity supplied. So, if this equality always occurs, why do the prices of stock shares ever change? **LO4**
- Suppose the total demand for wheat and the total supply of wheat per month in the Kansas City grain market are as shown in the table below. Suppose that the government establishes a price ceiling of \$3.70 for wheat. What might prompt the government to establish this price ceiling? Explain carefully the main effects. Demonstrate your answer graphically. Next, suppose that the government establishes a price floor of \$4.60 for wheat. What will be the main effects of this price floor? Demonstrate your answer graphically. **LO5**
- What do economists mean when they say “price floors and ceilings stifle the rationing function of prices and distort resource allocation”? **LO5**

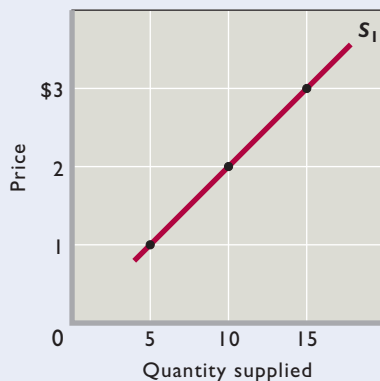
Thousands of Bushels Demanded	Price per Bushel	Thousands of Bushels Supplied
85	\$3.40	72
80	3.70	73
75	4.00	75
70	4.30	77
65	4.60	79
60	4.90	81

## Problems

- Suppose there are three buyers of candy in a market: Tex, Dex, and Rex. The market demand and the individual demands of Tex, Dex, and Rex are shown below. **LO1**
  - Fill in the table for the missing values.
  - Which buyer demands the least at a price of \$5? The most at a price of \$7?
  - Which buyer's quantity demanded increases the most when the price is lowered from \$7 to \$6?
  - Which direction would the market demand curve shift if Tex withdrew from the market? What if Dex doubled his purchases at each possible price?
  - Suppose that at a price of \$6, the total quantity demanded increases from 19 to 38. Is this a "change in the quantity demanded" or a "change in demand"?

Price per Candy	Individual Quantities Demanded						Total Quantity Demanded
	Tex		Dex		Rex		
\$8	3	+	1	+	0	=	___
7	8	+	2	+	___	=	12
6	___	+	3	+	4	=	19
5	17	+	___	+	6	=	27
4	23	+	5	+	8	=	___

- The figure below shows the supply curve for tennis balls,  $S_1$ , for Drop Volley Tennis, a producer of tennis equipment. Use the figure and the table below to give your answers to the following questions. **LO2**



- Use the figure to fill in the quantity supplied on supply curve  $S_1$  for each price in the table below.

Price	$S_1$ Quantity Supplied	$S_2$ Quantity Supplied	Change in Quantity Supplied
\$3	___	4	___
2	___	2	___
1	___	0	___

- If production costs were to increase, the quantities supplied at each price would be as shown by the third column of the table (" $S_2$  Quantity Supplied"). Use that data to draw supply curve  $S_2$  on the same graph as supply curve  $S_1$ .
  - In the fourth column of the table, enter the amount by which the quantity supplied at each price changes due to the increase in product costs. (Use positive numbers for increases and negative numbers for decreases.)
  - Did the increase in production costs cause a "decrease in supply" or a "decrease in quantity supplied"?
- Refer to the expanded table below from question 11. **LO3**
    - What is the equilibrium price? At what price is there neither a shortage nor a surplus? Fill in the surplus-shortage column and use it to confirm your answers.
    - Graph the demand for wheat and the supply of wheat. Be sure to label the axes of your graph correctly. Label equilibrium price  $P$  and equilibrium quantity  $Q$ .
    - How big is the surplus or shortage at \$3.40? At \$4.90? How big a surplus or shortage results if the price is 60 cents higher than the equilibrium price? 30 cents lower than the equilibrium price?

Thousands of Bushels Demanded	Price per Bushel	Thousands of Bushels Supplied	Surplus (+) or Shortage (-)
85	\$3.40	72	___
80	3.70	73	___
75	4.00	75	___
70	4.30	77	___
65	4.60	79	___
60	4.90	81	___

- How will each of the following changes in demand and/or supply affect equilibrium price and equilibrium quantity in a competitive market; that is, do price and quantity rise, fall, or remain unchanged, or are the answers indeterminate because they depend on the magnitudes of the shifts? Use supply and demand to verify your answers. **LO4**
  - Supply decreases and demand is constant.
  - Demand decreases and supply is constant.
  - Supply increases and demand is constant.
  - Demand increases and supply increases.
  - Demand increases and supply is constant.
  - Supply increases and demand decreases.
  - Demand increases and supply decreases.
  - Demand decreases and supply decreases.
- Use two market diagrams to explain how an increase in state subsidies to public colleges might affect tuition and enrollments in both public and private colleges. **LO4**

6. **ADVANCED ANALYSIS** Assume that demand for a commodity is represented by the equation  $P = 10 - .2Q_d$  and supply by the equation  $P = 2 + .2Q_s$ , where  $Q_d$  and  $Q_s$  are quantity demanded and quantity supplied, respectively, and  $P$  is price. Using the equilibrium condition  $Q_s = Q_d$ , solve the equations to determine equilibrium price. Now determine equilibrium quantity. **LO4**
7. Suppose that the demand and supply schedules for rental apartments in the city of Gotham are as given in the table below. **LO5**

Monthly Rent	Apartments Demanded	Apartments Supplied
\$2500	10,000	15,000
2000	12,500	12,500
1500	15,000	10,000
1000	17,500	7500
500	20,000	5000

- a. What is the market equilibrium rental price per month and the market equilibrium number of apartments demanded and supplied?
- b. If the local government can enforce a rent-control law that sets the maximum monthly rent at \$1500, will there be a surplus or a shortage? Of how many units? And how many units will actually be rented each month?
- c. Suppose that a new government is elected that wants to keep out the poor. It declares that the minimum rent that can be charged is \$2500 per month. If the government can enforce that price floor, will there be a surplus or a shortage? Of how many units? And how many units will actually be rented each month?
- d. Suppose that the government wishes to decrease the market equilibrium monthly rent by increasing the supply of housing. Assuming that demand remains unchanged, by how many units of housing would the government have to increase the supply of housing in order to get the market equilibrium rental price to fall to \$1500 per month? To \$1000 per month? To \$500 per month?

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