

**equilibrium price**

A price set by the interaction of demand and supply in which the absence of surpluses or shortages in the market means there is no tendency for the price to change.

**FIGURE 7.7**  
The market for T-shirts

Price of T-shirt	Quantity Demanded	Quantity Supplied
\$20	16	0
\$24	12	4
\$28	8	8
\$32	4	12
\$36	0	16

**CHECK THIS OUT!**

Someone asked the nineteenth-century British economist Alfred Marshall whether demand or supply was more important in determining price. Can you understand his reply?

*We might as reasonably dispute whether it is the upper or the under blade of a pair of scissors that cuts a piece of paper. . . . It is true that when one blade is held still, and the cutting is effected by moving the other, we may say . . . that the cutting is done by the second; but the statement is not strictly accurate.*

# Market Equilibrium

## THE DETERMINATION OF PRICE

At this point, we have the tools we need to examine how the actual prices we pay for a product are determined. You have probably guessed by now that, in the real world, the prices that consumers pay and sellers receive are determined by the interaction of demand and supply. If we combine our two schedules for T-shirts, we can see how this occurs.

By examining Figure 7.7, we can see that only at \$28 does the quantity demanded for T-shirts equal the quantity supplied. When the price is set lower than \$28, the quantity demanded for T-shirts will exceed the quantity supplied, and a shortage will occur. For example, if the price is set at \$24, then 12 T-shirts will be demanded, but the seller will supply only four, creating a shortage of eight T-shirts. In this situation, the seller will then raise the price, since the T-shirts are selling so quickly.

The question becomes: To what level should the price of T-shirts be raised? Suppose that the seller raises the price of T-shirts to \$32. The seller wants to sell 12 T-shirts, but consumers are only willing to purchase four. Now there is a surplus of eight T-shirts, and the seller will have to lower the price to persuade consumers to buy. The price of \$28 is the only price where no shortage or surplus occurs. Economists call this price the **equilibrium price** because supply equals demand; and when the market for a product or service is at equilibrium, there is no tendency for it to change. The equilibrium price is the only acceptable compromise between consumers who want the lowest prices possible and sellers who want the highest.

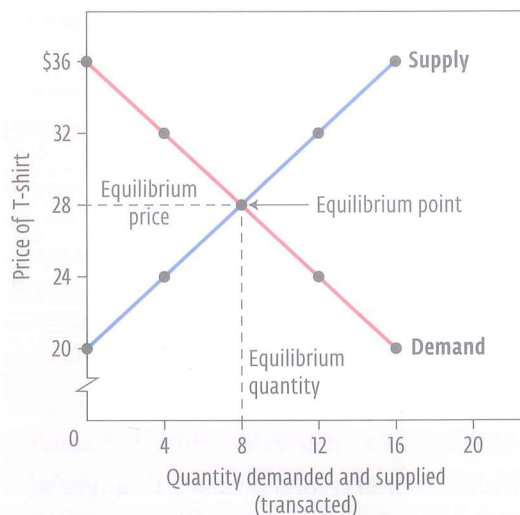
## A Demand and Supply Graph

We can easily combine the demand and supply data in Figure 7.7 into a graph. In Figure 7.8, we see that the demand curve crosses the supply curve at exactly \$28, which we have identified as our equilibrium price. Suppose that we wanted to use this graph to indicate what would happen if the selling price of a T-shirt were set *above* the equilibrium price. In Figure 7.9 a horizontal dashed line is drawn across the graph from the \$32 point on the vertical axis. Then vertical lines are drawn downward from the points at which the horizontal line intersects the demand and supply curves. These vertical lines provide us with a pictorial representation of the information in Figure 7.7: at a price of \$32, the quantity demanded is four T-shirts and the quantity supplied is 12 T-shirts. In other words, a price of \$32 will result in a surplus of eight T-shirts.

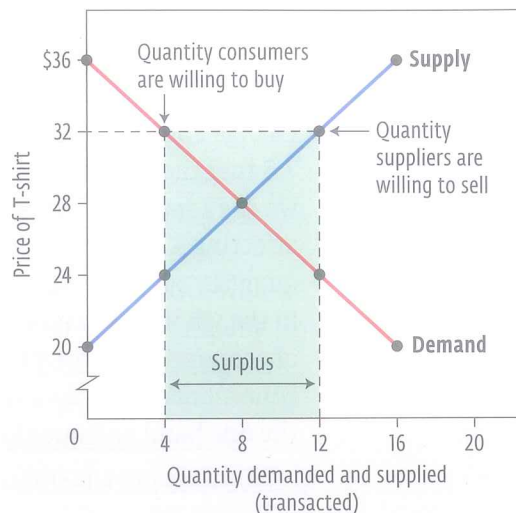
In Figure 7.10, we see the opposite situation illustrated, that is, what happens when the selling price of a T-shirt is set *below* the equilibrium price. Here, a horizontal dashed line drawn from the \$24 point on the vertical axis will intersect the demand and supply curves in such a way as to indicate a shortage of eight T-shirts. By studying these graphs, we can draw the following general conclusion:

*A price above the equilibrium price will result in a surplus of goods, while a price below the equilibrium price will result in a shortage of goods, as long as other things do not change.*

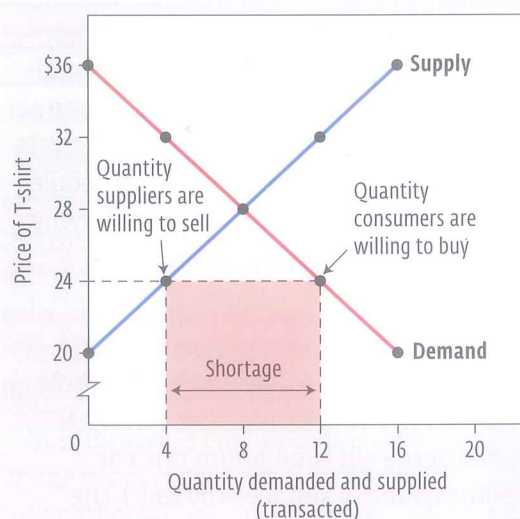
**FIGURE 7.8**  
The price and quantity demanded of T-shirts at equilibrium



**FIGURE 7.9**  
The price and quantity demanded of T-shirts above equilibrium



**FIGURE 7.10**  
The price and quantity demanded of T-shirts below equilibrium



**FIGURE 7.11**  
Data table for Self-Reflect questions

Price of Product	Quantity Demanded (Q <sub>d</sub> )	Quantity Supplied (Q <sub>s</sub> )
\$2.00	100	190
\$1.80	120	180
\$1.60	140	170
\$1.40	160	160
\$1.20	180	150
\$1.00	200	140
\$0.80	220	130

In our earlier example, we constructed a sample market of four consumers and one seller of T-shirts. It is worth noting that, in the real world, where markets can consist of thousands or millions of consumers and sellers, the laws of demand and supply operate in the same way as we have seen them operate on a small scale. A price set *below* the equilibrium price by sellers will mean that there are many frustrated consumers who are unable to purchase the product in question. Some of these consumers will start to offer to pay more than the stated price. As they try to outbid each other, they will force the price of the product to rise. In contrast, a price set *above* the equilibrium price will result in many unsold products. In this case, the sellers will try to undercut each other by lowering their prices. This process will continue until the quantity demanded equals the quantity supplied; that is, until the market reaches the equilibrium price.

### Self-Reflect

- 1 On graph paper, draw demand and supply curves for the prices and quantities shown in Figure 7.11 ( $Q_d$ , quantity demanded;  $Q_s$ , quantity supplied).
- 2 Shade in the areas of the graph that represent (a) a surplus; and (b) a shortage if prices higher and lower than the equilibrium price were to be set.



### non-price factor

A factor held constant in the relationship between price and quantity demanded and supplied. Non-price factors include, on the demand side, income, population, tastes and preferences, expectations, and prices of substitute and complementary goods; and on the supply side, costs, number of sellers, technology, nature and the environment, and prices of related goods.

## CHANGES IN DEMAND

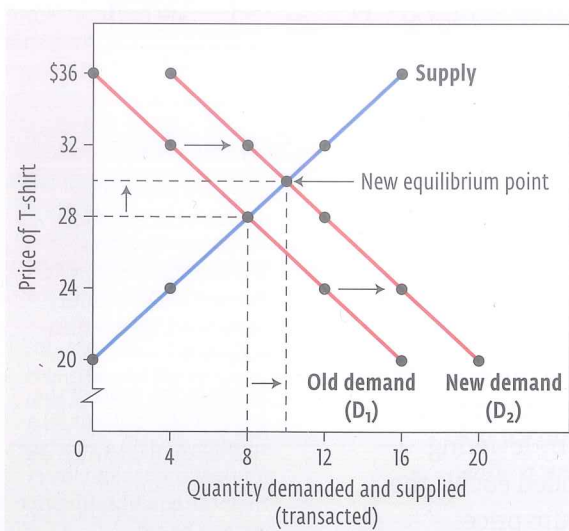
Up to this point, we have assumed that “other things do not change” in our discussion of demand and supply. These “other things” are all various **non-price factors** that we have so far held constant in constructing our demand and supply curves. We emphasized that the *quantity demanded* and the *quantity supplied* changed only because price changed. We saw on the graphs in Figures 7.2 and 7.6 that these changes are represented by movements *along* the curves. Now we shall see that changes in non-price factors cause the *whole curve to shift*, by affecting a product’s *demand* or *supply* as opposed to its quantity demanded or quantity supplied. This distinction between movements along a curve and a shift in the whole curve is one of the most important distinctions in the entire field of economics. Before proceeding further, it is crucial that we understand this concept and the way it hinges on the distinction between demand and supply on the one hand and quantity demanded and quantity supplied on the other.

Five non-price factors can affect consumer demand for a product. Changes to any one of these factors can cause the whole demand curve to shift its position on the graph. Let’s consider each of these factors in turn.

**FIGURE 7.12**  
An increase in demand for T-shirts

Price of T-Shirt	Old Quantity Demanded	New Quantity Demanded	Quantity Supplied (Qs)
\$20	16	20	0
\$24	12	16	4
\$28	8	12	8
\$32	4	8	12
\$36	0	4	16

**FIGURE 7.13**  
An increase in demand for T-shirts



### Income

Staying with our sample T-shirt market, let’s consider what would happen if the incomes of the four potential consumers increased substantially. With more income at their disposal, they might be willing to buy more T-shirts at whatever the prevailing market price is. The schedule in Figure 7.12 shows the result of this increase in buying power, and we can see that the quantity demanded increases at all price levels.

Figure 7.13 shows the new demand curve in relation to the old one. The increase in demand shifts the whole demand curve upward and to the right. Since the new quantity demanded at the old equilibrium price of \$28 now exceeds the quantity supplied (by four), the equilibrium price must shift upward. It moves to \$30, where the quantity supplied is 10. This increase in income has raised the equilibrium price for T-shirts by \$2.

### Population

Similar to an increase in incomes, an increase in the number of consumers should translate into an increase in demand, shifting the demand curve to the right causing the equilibrium price to increase. Similarly, a decrease in the number of consumers should have the opposite effect, shifting the demand curve to the left and causing the equilibrium price to fall.

## Tastes and Preferences

Changes in taste for a product cause increases or decreases in demand for it. If consumer preferences for T-shirts increase, demand overall will increase, the demand curve shifts up to the right, and the equilibrium price rises.

## Expectations

If consumers believe that the price of a particular product is going to rise in the future, they may decide to purchase it immediately, thereby increasing the demand for the product. Thus, the demand curve for a particular product will shift to the right if consumer expectations lead people to believe that price will increase in the future. Increased purchases by consumers create a self-fulfilling prophecy: the price of the product starts to rise almost immediately, driving the demand curve to the right. Conversely, if consumers expect the price of a product to fall in the future, they may delay purchasing that product, which will drive down the demand for it. As a result, consumers end up making the expected lower price of the future a reality in the present.

## The Price of Substitute and Complementary Goods

Economists include price changes of **substitute goods** under the non-price factors that can cause the whole demand curve to shift. If the price of good B (a substitute for good A) increases, the demand for good A will increase. Again, the demand curve shifts to the right, and the equilibrium price increases.

Others goods are **complementary goods**: they are interrelated and used together with other goods (for example, tennis rackets and tennis balls). An increase in demand for tennis rackets will increase the demand for tennis balls, shifting the demand curve for tennis balls to the right and driving up their equilibrium price.

In summary, a change in the price of one product that can substitute for another will *directly* increase or decrease the demand for the competing product, thereby shifting its demand curve one way or the other. A change in the price of a product that is associated with a complementary good will *inversely* increase or decrease the demand for the complementary good, thereby shifting its demand curve.

### substitute goods

Goods that are similar to other goods and that serve as an alternative if the price of a particular good rises.

### complementary goods

Goods that are interrelated and used together (for example, gasoline and automobiles).

A baseball bat, glove, and ball are considered complementary goods. Unlike substitute goods, a change in the price of one complementary good will inversely affect demand for its complements.





## CHANGES IN SUPPLY

A shift of the whole supply curve can be caused by a number of factors. Here, we will focus on the five major factors that can cause such a shift. A change in any of these factors will cause the supply curve to move either to the right (to indicate an increase in supply) or to the left (to indicate a decrease in supply).

### Costs

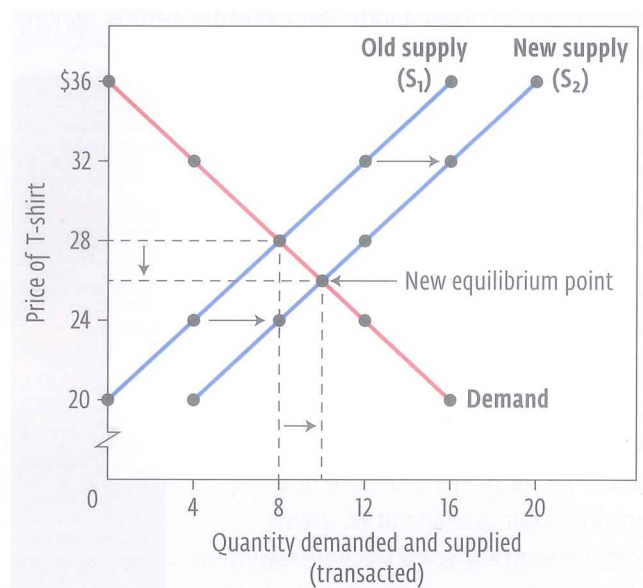
An increase or decrease in production costs will affect the quantities that sellers are willing to supply because a change in costs affects profits. Suppose that the cost of cloth for T-shirt manufacturing falls, and the manufacturer passes on this saving to the retailer, in this case our T-shirt seller. Figure 7.14 shows how such a saving might translate into new quantities supplied at each price level, representing an overall change in supply.

The T-shirt seller's increase in supply is illustrated as a movement from  $S_1$  to  $S_2$  in Figure 7.15. Note that consumers will be happy with this increase in supply because it means that the equilibrium price will drop from \$28 to \$26 per T-shirt. On the other hand, if there were an increase in manufacturing costs, the result would be a decrease in supply. This would be illustrated by a movement of the curve to the left and a corresponding increase in the equilibrium price.

**FIGURE 7.14**  
An increase in supply of T-shirts

Price of T-Shirt	Quantity Demanded	Old Quantity Supplied	New Quantity Supplied
\$20	16	0	4
\$24	12	4	8
\$28	8	8	12
\$32	4	12	16
\$36	0	16	20

**FIGURE 7.15**  
An increase in supply of T-shirts



## Number of Sellers

The number of sellers may have an effect on the amount of a product that is supplied in a market. If the number of sellers in a market increases, the quantity supplied of a product at any given price will increase, shifting the supply curve to the right. If the number of sellers in a market decreases, and if the remaining sellers do not increase their production, then the quantities supplied of a product at any given price will decrease. The effect will be a shift of the supply curve to the left.

## Technology

An improvement in technology will decrease the cost of production, and this, in turn, will enable manufacturers to supply more of a product at any given price. The economic history of the twentieth and twenty-first centuries is largely a story of technological progress of such magnitude that the manufacturing costs have fallen for almost every product we now buy. Technological and productivity improvements have enabled manufacturers to increase the supply of their products, thereby shifting their supply curve to the right, and lowering prices.

## The Environment

Something as simple as a change in the weather can have an enormous impact on the supply of certain products, particularly agricultural products. Drought, for instance, can dramatically decrease the quantities of crops that farmers can produce. Similarly, an environmental disaster can affect supply. The collapse of the Atlantic cod stock decreased the quantity of cod supplied to fish retailers, which, in turn, has driven up the price of this particular fish. This decrease in supply has shifted the supply curve for Atlantic cod to the left.

## Prices of Related Products

The production of one product may affect the supply of another related product. Farmers may switch from growing oats to growing barley if the market price of barley rises. As a result, the supply of oats will decrease at any given price, shifting its supply curve to the left.

## Self-Reflect

1 Which of these four possibilities—a change in quantity demanded, a change in quantity supplied, a shift in demand, or a shift in supply—do each of the following illustrate?

- New steel-making techniques lower steel prices.
- Gold-mining activity picks up as world gold prices increase.
- The price of cellphones falls, and consumers buy more of them.
- An economic downturn lowers incomes affecting consumer purchases of high-end consumer goods.



# Thinking like an Economist

## Changes in Quantity Demanded or Supplied versus Shifts in Demand or Supply

It is important to understand the distinctions between changes in the quantity demanded or supplied of a product and shifts in the demand or supply of a product. Changes in the quantity demanded or supplied are movements *along* the demand or supply curve caused by price changes of the product itself. Shifts in demand or supply are movements of the *whole* demand or supply curve caused by factors other than price changes of the product.

In Figure 7.16, graph (a) shows a change in the quantity demanded of a product caused by a change in price. It is clearly a movement along the demand curve. When the price of the product rises, the quantity demanded of the product falls; when the price of the product falls, the quantity demanded of the product rises. An inverse relationship exists between price and quantity demanded.

Graph (c) shows a change in the quantity supplied of a product caused by a change in price. It is clearly a movement along the supply curve. When the price of the product rises, the quantity supplied of the product rises; when the price of the product falls, the quantity supplied of the product falls. A direct relationship exists between price and quantity supplied.

Graphs (b) and (d) represent shifts of the whole demand or supply curve. We see in (b) a shift in demand caused by a change in factors other than the product's price. The shift could be caused by factors including a change in consumer incomes, an increase or decrease in the number of potential consumers, a change in the price of substitutes for the product, or a change in the prices of complements of the product. If one or more of these factors increase or change in a positive way, the whole demand curve shifts up to the right. In this context, we would say that demand has increased. And the opposite holds: if one or more factors decrease or change in a negative way, the

whole demand curve shifts to the left, and we would say that demand has decreased.

Graph (d) shows shifts in supply. They are caused by changes in factors other than the price of the product itself, such as changes in the cost of production, technology, the number of sellers, or environmental factors. A shift to the left indicates a decrease in supply of the product, which is often caused by an increase in costs. A shift to the right indicates an increase in the supply of the product, which is possibly caused by a decrease in costs, better technology, or (in the case of agriculture) good weather.

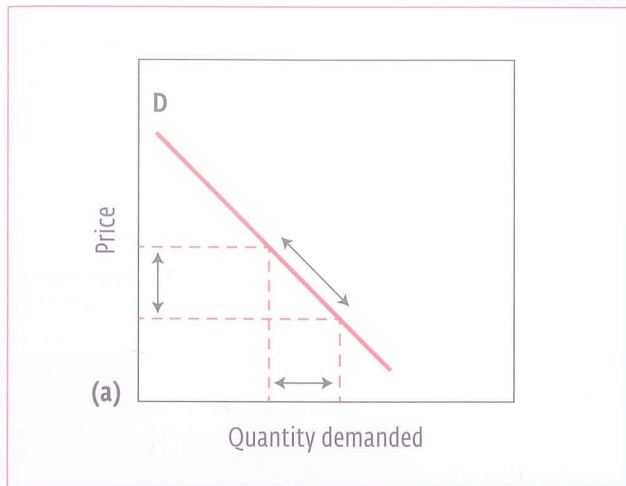
### APPLYING ECONOMIC THINKING

Which of the four diagrams in Figure 7.16 does each of the following market situations correspond to regarding the market for electric cars?

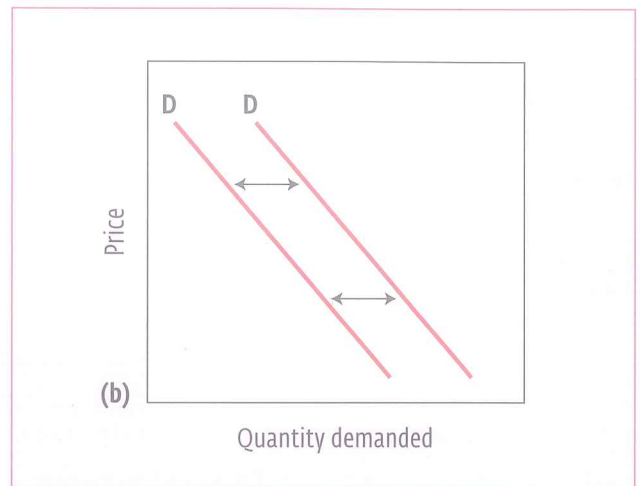
- 1 Climate change concerns begin to interest more people in electric cars rather than gas fuelled cars.
- 2 Electric car manufacturers receive tax breaks from government to encourage production.
- 3 Consumers receive tax breaks from government to encourage the purchase of electric cars.
- 4 Governments build more charging stations for electric vehicles.
- 5 Prices of electric cars start to fall.

**FIGURE 7.16**

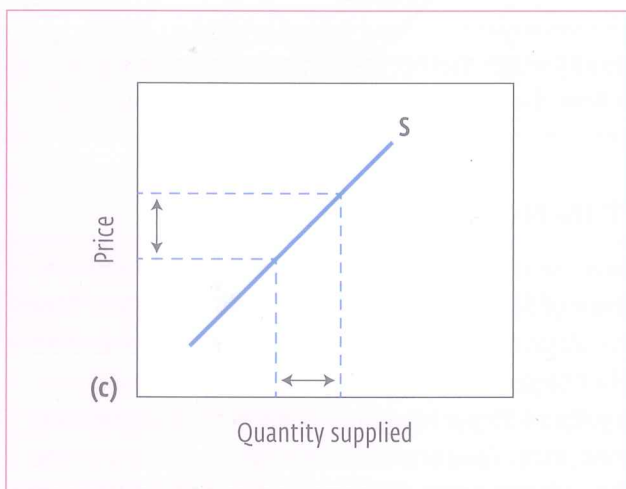
Graphing changes in quantity demanded, demand, quantity supplied, and supply



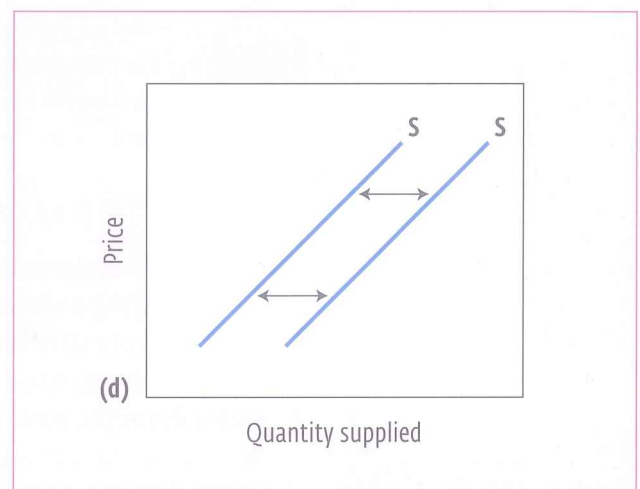
- (a) **A change in quantity demanded.** A change in price causes a shift along the demand curve to show a change in the quantity demanded.



- (b) **A change in demand.** A non-price change causes the whole curve to shift.



- (c) **A change in quantity supplied.** A change in price causes a shift along the supply curve to show a change in the quantity supplied.



- (d) **A change in supply.** A non-price change causes the whole curve to shift.



**perfect (or pure) competition**

A rare market structure characterized by many sellers (selling exactly the same product) and many buyers, no barriers to entry into the market for new firms, and perfect knowledge of prices (so there are no price differences and no individual can influence them).

**dynamic pricing**

The practice of changing price as demand increases or decreases within a short time frame.

## The Determination of Price in a Competitive Market

We can now analyze the way price is actually determined in a *competitive market*—a market that exhibits the following characteristics:

- It has many producers or sellers, with no single seller large enough to dominate the market.
- It has many consumers, with no single consumer large enough to dictate price to sellers.
- Each seller's product is exactly the same as that of the others so that no seller can increase price based on having a higher-quality product than another seller.
- All sellers and consumers know what the prices and conditions are throughout the entire market, thereby eliminating the possibility of any price differences.

This kind of market is called **perfect (or pure) competition**. In a modern economy, it is rare for all of these conditions to be present in a particular market. Nevertheless, perfect competition is an ideal or a model that economists use to compare and evaluate actual markets for the products and services bought and sold in Canada and in other countries that have free-market systems.

For purposes of instruction, let's analyze the retail coffee market in North America. This comes as close as any other market to the perfect competitive market model, and it shows us how changes in demand and supply, with their shifting curves, cause the equilibrium price to rise and fall.

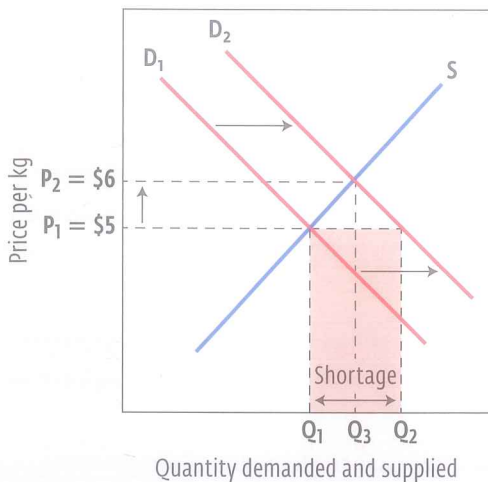
### THE COFFEE MARKET IN NORTH AMERICA

- **An increase in demand** will have the following effect: Suppose that retailers are used to paying a wholesale price of \$5 per kilogram for Colombian coffee. Then the spread of coffee houses as social meeting places throughout North America increases the demand for Colombian coffee. In Figure 17A,  $D_1$  and  $S$  show coffee at the old equilibrium price of \$5 per kilogram.  $Q_1$  shows the quantities demanded and supplied at that price. The increase in demand to  $D_2$  causes an excess demand, or shortage ( $Q_2 - Q_1$ ), to occur. This excess demand will cause the price to rise to \$6 at  $P_2$ ; the quantity demanded and supplied will be equal at  $Q_3$ . The new equilibrium price and quantity supplied eliminate the excess demand.
- **A decrease in demand** will have the following effect: Suppose that a best-selling book raises health concerns about excessive caffeine intake. As a result, many people cut back on the number of cups of coffee they drink per day and turn to other beverages. This reduces the demand for coffee. In Figure 17B,  $D_1$  and  $S$  show coffee at the old equilibrium price of \$5 per kilogram.  $Q_1$  indicates the quantities demanded and supplied at that price. The decrease in demand to  $D_2$  causes excess in supply, or surplus ( $Q_1 - Q_2$ ), to occur. This excess in supply causes the price to fall to \$4 at  $P_2$ ; the quantity demanded and supplied will be equal at  $Q_3$ . The new equilibrium price and quantity supplied eliminate the excess supply.

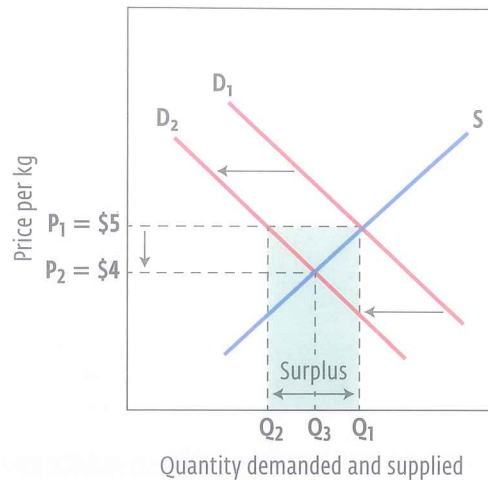
### DID YOU KNOW?

**Dynamic pricing** is a strategy in which a company's product prices continuously adjust, sometimes in a matter of minutes, in response to real-time supply and demand. It is used with online taxi companies such as Uber, large retailers such as Amazon and Walmart, airlines, and concert ticket sellers.

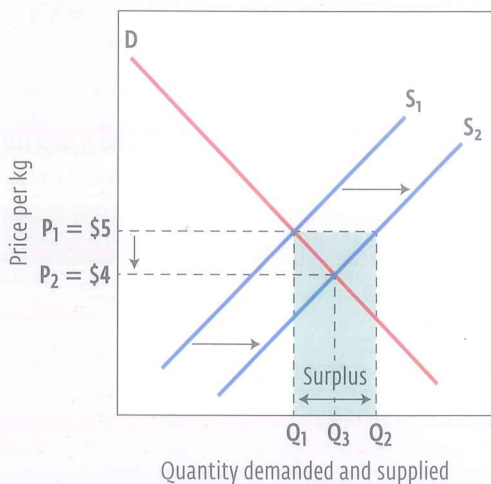
**FIGURE 7.17A**  
An increase in demand in the coffee market



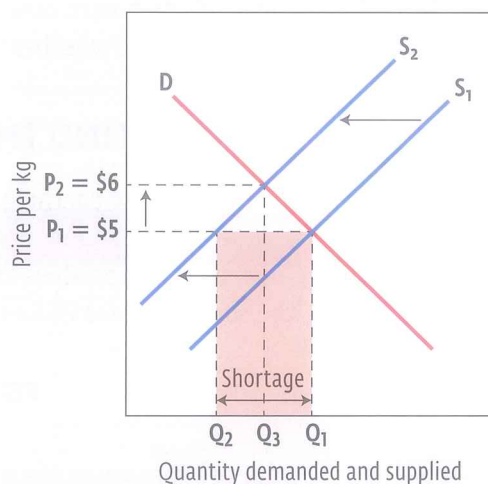
**FIGURE 7.17B**  
A decrease in demand in the coffee market



**FIGURE 7.17C**  
An increase in supply in the coffee market



**FIGURE 7.17D**  
A decrease in supply in the coffee market



- **An increase in supply** will have the following effect: Suppose that scientists discover a way to produce a faster-growing coffee plant through genetic manipulation. In Figure 17C,  $D$  and  $S_1$  show coffee at the old equilibrium price of \$5 per kilogram.  $Q_1$  indicates the quantities demanded and supplied at that price. The increase in supply ( $S_2$ ) causes an excess supply, or surplus, ( $Q_2 - Q_1$ ) to occur. This will cause the price to fall to \$4 at  $P_2$  and the quantity demanded to rise to  $Q_3$ . This movement shifts the supply curve to the right. The new equilibrium price and quantity demanded eliminate the excess supply.
- **A decrease in supply** will have the following effect: Suppose that a mildew that strikes coffee plants decimates coffee production in the mountains of Colombia. Supplies of Colombian coffee fall. In Figure 17D,  $D$  and  $S_1$  show coffee at the old equilibrium price of \$5 per kilogram;  $Q_1$  shows the quantities demanded and supplied at that price. This decrease in supply to  $S_2$  causes an excess demand, or shortage ( $Q_1 - Q_2$ ), to occur. This will cause the price to rise to \$6 at  $P_2$ ; the quantity demanded and supplied will be equal at  $Q_3$ . The new equilibrium price and quantity demanded eliminate the excess demand.

### Self-Reflect

- 1 Does price rise or fall with each of the following changes? Draw small, freehand graphs to illustrate:
- Demand increases, supply stays the same.
  - Supply decreases, demand stays the same.
  - Supply increases, demand stays the same.
  - Demand decreases, supply stays the same.



**price elasticity of demand (PED)**

An expression of how much more or less consumers will buy of a product if its price changes.

**price inelastic**

If the quantity of a good or service bought does not change much when price rises or falls, it is said to be price inelastic.

**price elastic**

If the quantity of a good or service bought changes a lot when price rises or falls, it is said to be price elastic.

## The Elasticity of Demand

We learned that consumers buy more of a product when its price falls and less of it when its price rises. What we did not learn is *how much more* they will buy or *how much less*. You may wonder if it is really possible to calculate such numbers with any precision. As a matter of fact, economists have developed a formula to measure how responsive the quantity bought of a good is to a change in price. This concept is known as the **price elasticity of demand (PED)**, and it is defined as a measurement of how responsive the quantity bought of a good is to a change in price. In general, we find that:

- If the quantity bought of a good *does not* increase or decrease much when price changes, it is said to be **price inelastic**. That is, it is less responsive to price changes.
- If the quantity bought of a good *does* increase or decrease when price changes, it is said to be **price elastic**. That is, it is more responsive to price changes.

We will first learn how to calculate price elasticity. Then, we will look at factors that determine whether a good is likely to be inelastic or elastic.

### CALCULATING THE PRICE ELASTICITY OF DEMAND

Economists use coefficients to determine the price elasticity of a product. A coefficient is a number that captures the responsiveness between two variables. Here, the two variables are *quantity demanded* and *price*. The formula that gives us the coefficient for PED is as follows:

$$\text{PED} = \frac{\% \text{ change in quantity demanded}}{\% \text{ change in price}}$$

Suppose that when the price of a product was increased by 5 percent, the quantity demanded fell by 10 percent. Then,

$$\text{PED} = \frac{-10\%}{+5\%} = -2.0$$

For another product, suppose that when the price was decreased by 3 percent, the quantity demanded rose by 2 percent. Then,

$$\text{PED} = \frac{2\%}{-3\%} = -0.67$$

By convention, we use the absolute value of the PED coefficient, so the minus sign is dropped.

If the PED coefficient is greater than 1.0, then the product is classified as *price elastic*. Thus, the first example above is price elastic because the PED coefficient is 2.0. If the PED coefficient is less than 1.0, then the product is classified as *price inelastic*. Thus, the second example above is price inelastic because its PED coefficient is 0.67. If the PED coefficient is equal to 1.0, then the product is considered to have *unitary* demand elasticity.

## FACTORS AFFECTING THE ELASTICITY OF DEMAND

Four factors can have a strong effect on the elasticity of demand. Let's consider each of these in turn.

### Availability of Substitutes

Goods that have substitutes tend to be more elastic than goods that do not. A single brand of candy, for example, is usually very elastic. Since many other brands of candy are available, consumers will reduce their purchases of a particular candy sharply if the candy manufacturer raises that candy's price. The demand for candy in general is inelastic, however, because there is no close substitute for candy. Consumers will not significantly reduce their expenditures for it if prices rise or significantly increase them if prices fall.

### Nature of the Product

Goods that are necessities tend to be more inelastic than goods that are considered luxuries. A necessity such as bread is inelastic; price changes do not significantly change the quantities consumers' purchase. A luxury such as a vacation cruise, on the other hand, is elastic because if prices rise, people can do without this kind of vacation.

### Fraction of Income Spent on the Product

Goods that are expensive and, therefore, take up a large part of the household budget, will be elastic. If prices rise for "big-ticket" items such as houses, cars, or furniture, people do without the item entirely, postpone the purchase, or search for substitutes. By contrast, a product that takes up a small percentage of the budget, such as shoelaces, may rise in price without registering a significant decline in the amount purchased. Such a product is classified as inelastic.

### Amount of Time Available

Over time, some goods may become more elastic because consumers eventually find substitutes for them. In the short run, however, demand for these same goods can be quite inelastic because consumers may not know what substitutes are available immediately after the price rises. Let's consider gasoline as an example. When the price of gasoline rises, car owners initially may reduce the amount of driving they do, but not significantly. However, if gasoline prices remain high over a long period of time, drivers may switch to smaller cars to reduce their gasoline consumption.

### Self-Reflect

- 1 For which of the following products would demand be elastic? Inelastic? Unitary? Explain why in each case.
  - beef
  - pencils
  - steak
  - housing
  - gasoline
  - public transportation
- 2 A seller finds out that the PED for the product being sold is 1.5. Would it be better to lower the price or raise the price to gain more sales revenue? How might the seller's sales strategy change if the PED for the product were 0.8?



**elasticity of supply**

The responsiveness of the quantity supplied by a seller to a rise or fall in its price.

**price elasticity of supply (PES)**

An expression of how responsive the quantity supplied by a seller is to a rise or fall in the price of a product.

## The Elasticity of Supply

The concept of elasticity also applies to the supply, or sellers', side of the market. You will remember that, generally, as the market price for a product rises, suppliers want to supply more of that product because their profits will increase. Can a supplier easily increase the quantity supplied of a product if consumers increase demand? Or, is it more difficult to increase the quantity supplied to take advantage of higher prices? The concept of **elasticity of supply** measures how responsive the quantity supplied by a seller is to a rise or fall in price of a product.

### CALCULATING THE PRICE ELASTICITY OF SUPPLY

The formula that gives us the coefficient for **price elasticity of supply (PES)** is as follows:

$$\text{PES} = \frac{\% \text{ change in quantity supplied}}{\% \text{ change in price}}$$

Suppose that when the market price of a product was increased by 16 percent, the quantity supplied increased by 18 percent. Then,

$$\text{PES} = \frac{18\%}{16\%} = +1.12$$

For another product, suppose that when the market price was increased by 8 percent, the quantity supplied increased by 6 percent. Then,

$$\text{PES} = \frac{8\%}{6\%} = +0.75$$

Because the quantity supplied always rises when the price rises, the PES coefficient is always positive (+). If the price falls, the quantity supplied falls too, and the PES coefficient is positive as well. PES, calculated either as  $\frac{+}{+} = +$  or  $\frac{-}{-} = +$ , will result in positive coefficients whether the price for a product rises or falls. By convention, the positive sign is dropped.

If the PES coefficient is greater than 1.0, then the product is *supply elastic*. Thus, the first example above is supply elastic because its PES coefficient is 1.12. If the PES coefficient is less than 1.0, then the product is *supply inelastic*. Thus, the second example above is supply inelastic because its PES coefficient is 0.75. If the PES coefficient is 1.0, then the product has *unitary supply elasticity*.

## FACTORS AFFECTING THE ELASTICITY OF SUPPLY

Three factors can have a strong effect on the elasticity of supply. An understanding of each of these factors will give us a deeper appreciation for the importance of the elasticity of supply.

### Time

The longer the time period a seller has to increase production, the more elastic the supply will be. A classic example is a seller of fresh fruits and vegetables. Suppose that the price of tomatoes rises. Tomato growers cannot increase production in one day, or even in one month. Supply, therefore, is inelastic and remains so until more tomatoes can be planted, harvested, and brought to market. In summarizing a situation like this, economists say that in the short term, supply is inelastic, and in the long term, it is elastic.



### Ease of Storage

When the price of a product drops, sellers have two options. They can either sell the product at the new low price, or they can put some of their inventory into storage and sell it after the price rises again. The steel industry enjoys high supply elasticity because it is easy to store steel and, therefore, ride out price changes. Agricultural industries have low supply elasticity because it is difficult to store large volumes of their products in a manner that will keep them fresh. This adds to the problems they have in supplying more of a product to the market if prices rise in the short run.

When the price of tomatoes rises, tomato growers cannot increase production immediately. Supply, therefore, is *inelastic in the short term*; that is, until more tomatoes can be planted, harvested, and brought to market.

### Cost Factors

Increasing output (supply) may be costly, depending on the industry. Car manufacturers may be able to increase production in the short term by requiring workers to put in more overtime. A permanent increase in production, however, may entail building new factories, which is a far more costly move on the part of the manufacturer. Supply is more elastic in industries that have lower input expenses. CDs, for example, are not costly to manufacture, and their production can be easily expanded if the demand for a particular performer rises.

### Self-Reflect

1 Apply the concept of supply elasticity to each of the following products. How elastic or inelastic would each be, and why?

- a new app
- cheese
- cellphone
- new housing
- renewable energy



# Thinking like an Economist

## Elasticity and Slopes of Demand and Supply Curves

Graphs of demand and supply curves provide us with good visual representations of the different kinds of elasticity we have just considered.

In Figure 7.19, an inelastic demand curve, price changes more when compared with the change in the quantity demanded.

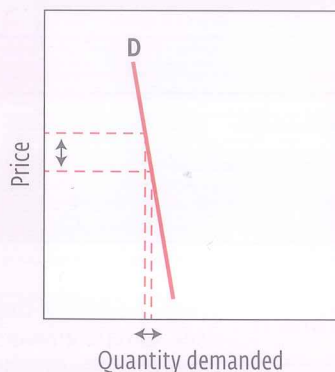
In Figure 7.20, an elastic demand curve, price changes less when compared with the change in the quantity demanded.

In Figure 7.21, a unitary demand curve, the quantity demanded changes exactly in proportion to price changes.

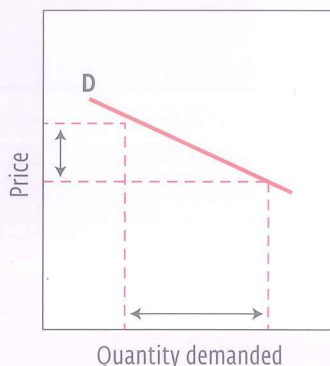
In Figure 7.22, an inelastic supply curve, the quantity supplied changes less when compared with the change in price.

In Figure 7.23, an elastic supply curve, the quantity supplied changes more when compared with the change in price.

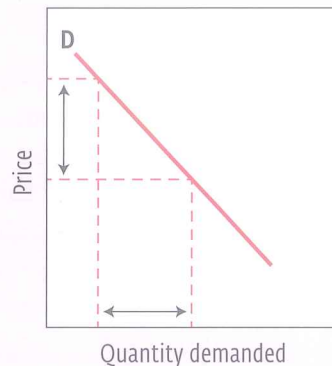
**FIGURE 7.19**  
An inelastic demand curve



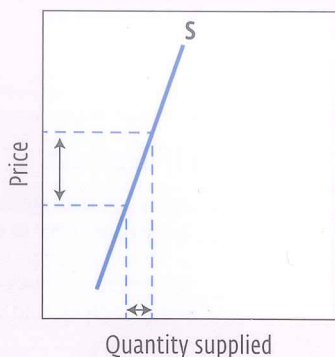
**FIGURE 7.20**  
An elastic demand curve



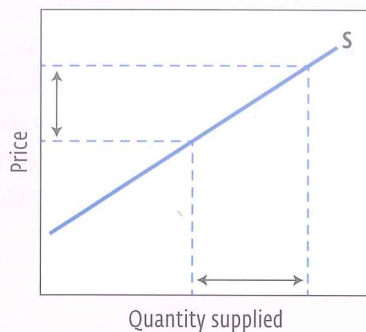
**FIGURE 7.21**  
A unitary demand curve



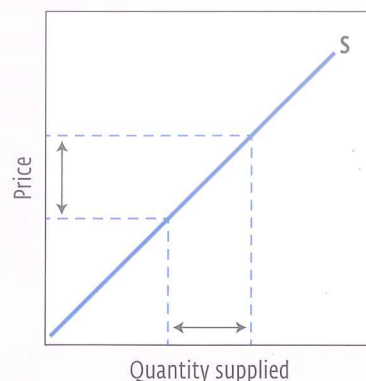
**FIGURE 7.22**  
An inelastic supply curve



**FIGURE 7.23**  
An elastic supply curve



**FIGURE 7.24**  
A unitary supply curve



We see that steep demand and supply curves are inelastic, while less steep curves are elastic. We can use demand and supply curves to analyze changes that occur in markets in the economy. For example:

### **The oil and gas market**

- Recent history has shown this market to be especially changeable. Cutbacks in production, particularly in the Middle East, or oil spills and refinery shutdowns cause supply to fall, causing big price swings. Draw a freehand graph similar to Figure 7.19 with a supply curve. Draw another supply curve to indicate a production cutback. Note that it does not take much of a supply decrease to push the price up a lot on an inelastic demand curve.

### **Cellphones**

- The first commercial cellphone was a Motorola device that weighed 1.1 kg, allowed 30 minutes of talk time, and cost US\$3 995. Draw a freehand graph similar to Figure 7.20. It illustrates the highly elastic demand for cellphones at that time. Draw one supply curve through a higher price on the demand curve, and draw another supply curve through a lower price on the demand curve. Note how the quantity demanded increases a lot compared with the fall in price, which increases sales revenues. Technology companies knew that if they could reduce prices, their revenues would increase dramatically. The price you pay for your phone today illustrates the success that those technology companies have had in lowering costs, improving quality, and, in the process, becoming some of the world's richest companies.

### **Skilled labour versus lower-skilled jobs**

- Figures 7.22, 7.23, and 7.24 can illustrate labour markets, with wages replacing prices. The Figure 7.22 illustrates the inelastic supply of skilled workers. There are fewer of them, it is more costly and takes more time to train them, and wages must rise considerably to attract them. Notice that a fairly large wage increase brings in a much smaller number of workers. Thus, the supply tends to be inelastic, at least in the short run. Figures 7.23 illustrates the more elastic supply of lower-skilled workers. There is a larger pool available, training takes less time, and wages do not have to rise much to attract more of them. Notice that wages do not have to rise much to attract a larger number of workers. Figure 7.24 illustrates a unitary supply curve, where the quantity supplied of labour changes exactly in proportion to wage changes.

## **APPLYING ECONOMIC THINKING**

For each of the following, determine the elasticity of the good, draw freehand demand and supply graphs to illustrate the market situation, and predict whether sales revenue will rise or fall

- 1 Restrictions on milk production raise the price of milk for consumers.
- 2 Producers of generic pharmaceutical drugs enter the market, and the price of generic drugs falls.
- 3 Advances in agricultural technology result in lower food costs.
- 4 Airlines reduce the seat size and legroom for non-business class passengers.



**ceiling price**

A restriction imposed by a government to prevent the price of a product from rising above a certain level.

## Government Intervention in Markets

Former US President Ronald Reagan once used the phrase “the magic of the marketplace” to explain the buoyant state of the American economy during his terms in office (1981–1985, 1985–1989). His brief description of a market economy was accurate in many ways. The market engines of demand and supply automatically produce the vast range of goods and services consumers want and then distribute these goods and services with a minimum of waste or shortages. All of this happens without the benefit of any individual or group providing direction for the economy.

Governments do, however, intervene extensively in markets. Why do they do this? Are they threatening the “magic of the marketplace” by intervening? To answer these questions, we will look at three examples of controversial government actions:

- 1 If the government believes that people are paying too high a price for a product, it will introduce a *ceiling price* as a solution.
- 2 If the government believes that sellers are receiving too low a price for a product, it will introduce a *floor price* as a solution.
- 3 If the government believes that it must intervene in a market for social or environmental reasons, it will introduce a *subsidy* or a *quota* as a solution.

### CEILING PRICES

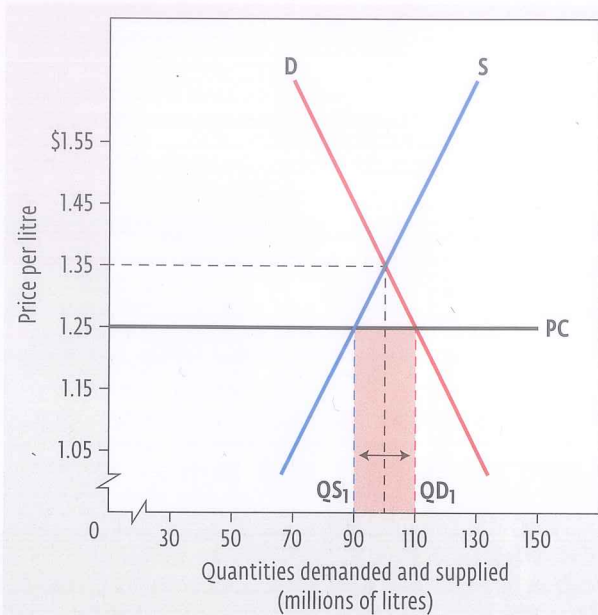
A **ceiling price** is a restriction placed by a government to prevent the price of a product from rising above a certain level. If the ceiling price is set below the

equilibrium price, a shortage will result. Consider the market for gasoline illustrated in Figure 8.7. Suppose that an international crisis has interfered with oil supplies to such an extent that gasoline prices start to climb. The government, concerned by the hardship these price increases have caused for motorists, places a price ceiling (PC) on gasoline. The equilibrium price was \$1.35 per litre, with 100 million litres per month demanded and supplied. The price ceiling prohibits prices from rising above \$1.25 per litre. At this price, 110 million litres ( $Q_{D1}$ ) are demanded, and 90 million litres ( $Q_{S1}$ ) are supplied. The result is a shortage of 20 million litres of gasoline ( $Q_{D1} - Q_{S1}$ ).

There are three possible outcomes of price ceilings. First, the shortages can cause long lineups for the product. This problem occurred in 1974 in the United States when American motorists pressured their government to restrict the rising price of gasoline. This price ceiling led to gasoline shortages and long lineups that snaked for blocks around gas stations until the

**FIGURE 8.7**  
The gasoline market

The effect of a ceiling price is a shortage.



ceilings were lifted to allow the price of gasoline to rise and bring demand and supply into equilibrium.

Second, price ceilings may create a **black market** for certain goods. This happens when a shortage of a product encourages some people to buy up as much of it as they can at the ceiling price, stockpile it, and then sell it at a higher price to people who cannot get enough for their own use. This happened in Canada during the Second World War when the government rationed several basic food items.

Third, price ceilings may cause the quality of a product to suffer if sellers try to reduce their costs to make more money. This situation is less likely to occur with natural resource products such as gasoline or foods, but it occurs more frequently when the government places a ceiling on a product such as rental accommodations.

### black market

The illegal exchange of goods in short supply, as when some people buy up as much of a good as possible, stockpile it, and sell it at a higher price.

### floor price

A restriction that prevents a price from falling below a certain level.

## FLOOR PRICES

A **floor price** is a restriction that prevents a price from falling below a certain level. If the floor price is set above the equilibrium price, it will cause a surplus. Suppose that the government believes that milk producers are making too little profit on milk, which is priced at \$1.50 per litre. The government may set a floor price (FP) of \$1.60 per litre, below which prices are not allowed to fall. The result can be seen in Figure 8.8.

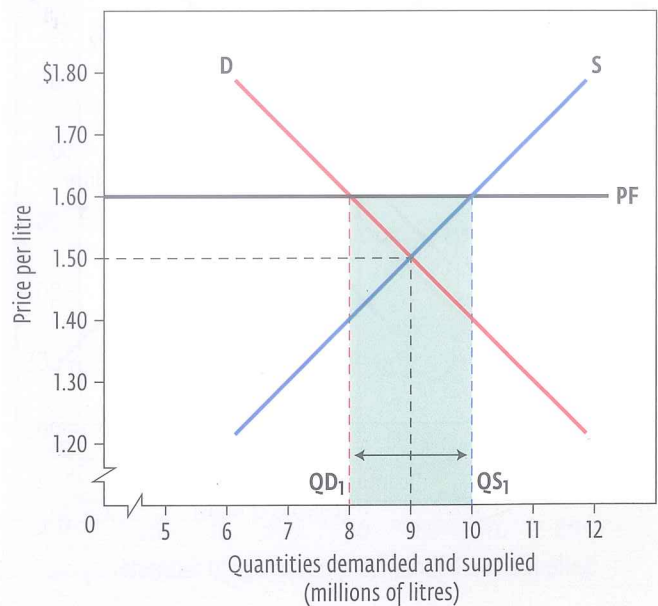
The line labelled “FP” is the floor price of \$1.60 per litre. At that price, 10 million litres will be supplied, which is more than the 9 million litres that would have been supplied at the equilibrium price of \$1.50 per litre. The higher floor price cuts the quantity demanded to 8 million litres, less than would be demanded at the equilibrium price. The result is a surplus of 2 million litres of milk ( $QD_1 - QS_1$ ).

Maintaining this floor price causes two problems. One problem is what to do with the surplus. To keep the floor price at \$1.60 per litre, the government must buy the surplus of milk (using taxpayers’ money) with little chance that the surplus will generate a return. It cannot be sold within the country at prices below the floor price without undercutting the floor price. Sometimes, surpluses can be sold on the world market or donated to less-developed countries. Otherwise, since milk is perishable, it must be turned into products that can be stored, such as powdered milk, butter, and cheese.

The second problem is that consumers on the whole pay a higher price for the product and receive less. In Figure 8.8, we can see that consumers in an unregulated market would probably have paid the equilibrium price of \$1.50 per litre and would have received 9 million litres of milk. With the floor price set by the government, consumers pay \$1.60 per litre and receive 8 million litres of milk.

**FIGURE 8.8**  
The milk market

The effect of a floor price is a surplus.





**subsidy**

A grant of money from a government to a producer to achieve some desired outcome, such as the installation of pollution-control equipment.

**SUBSIDIES AND QUOTAS**

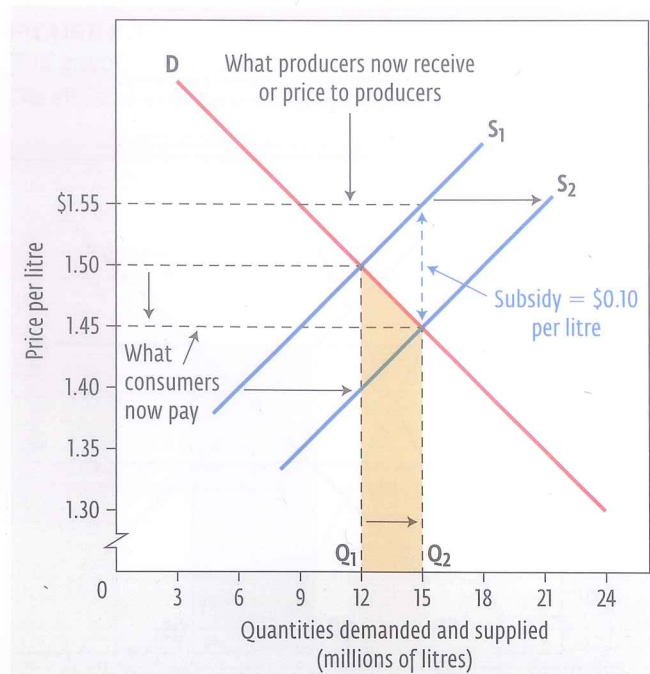
Both price ceilings and price floors share a common problem: less of the product is actually exchanged between sellers and consumers when the price is forced away from its equilibrium price by government policies. (Look again at Figures 8.7 and 8.8 to verify this important point.) To avoid this problem, governments sometimes provide subsidies. A **subsidy** is a grant of money from a government to a particular industry to achieve some desired outcome, such as lowering the financial burden placed on an industry.

Let's look at Figure 8.9 to see how the milk market will be affected by a subsidy of \$0.10 per litre. The immediate impact is that the supply curve increases by the amount of the subsidy, since producers supply more milk because they are receiving an extra \$0.10 per litre. The result is that the new equilibrium price of \$1.45 is lower than the old equilibrium price of \$1.50, and the quantity of milk sold is increased by 3 million litres (from  $Q_1$  to  $Q_2$ ).

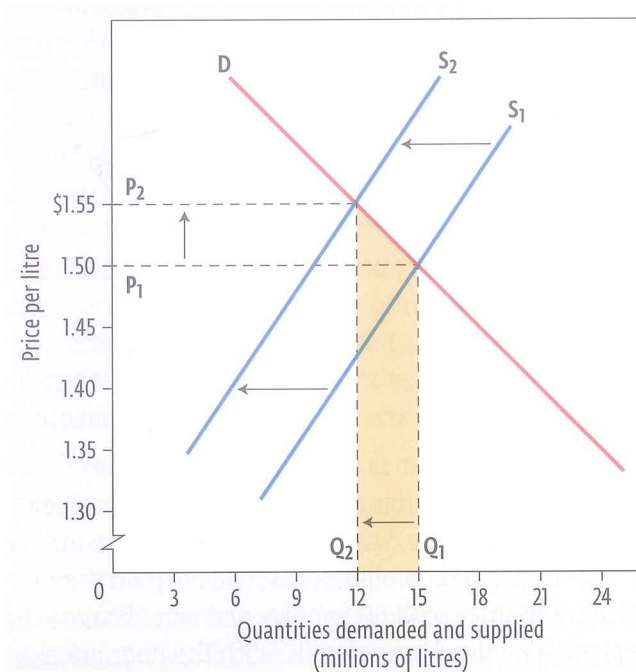
Subsidies benefit consumers with lower prices and sellers with extra revenue. They also lead to an increase in the exchange of products between consumers and sellers. However, subsidies have a couple of drawbacks. Since taxpayers pay for subsidy programs, some critics charge that subsidies keep inefficient producers in business. In the global economy, subsidies are often seen as barriers to fair trade.

**FIGURE 8.9**

The effect of a subsidy is to increase the quantity supplied

**FIGURE 8.10**

The effect of a quota is to increase the income of suppliers by raising the price of a product



Quotas are another means of helping producers. A **quota** is a restriction placed on the amount of a product that individual producers are allowed to produce. These restrictions are administered by organizations called **marketing boards**, composed of representatives from the government and from the industry. As one example, milk marketing boards operate in every province in Canada.

Figure 8.10 illustrates what happens when a provincial marketing board enforces a reduced quota of 3 million litres on all milk producers in the province. S2 shows the shift of the supply curve to the left. P2 at \$1.55 is the new, higher price, and Q2 at 12 million litres is the new, smaller amount of milk that is actually sold.

Quotas set by marketing boards raise farmers' incomes mainly because food is an inelastic commodity. Remember that when prices rise on an inelastic product, sales revenue also rises because the quantity demanded does not fall by much.

Farmers were given the authority to establish marketing boards years ago because governments believed that their incomes were, on average, too low. Farmers are producing an essential commodity, and if too many of them go out of business, so the argument goes, Canadians will wind up paying more for their food. Critics reply that marketing boards raise prices above the equilibrium point, with the result that less of the product is actually produced and exchanged. Whatever the argument, the fact remains that most of the Canadian meat, vegetable, and dairy products we buy in supermarkets are sold to the stores by marketing boards.

### quota

A restriction placed on the amount of product that domestic producers are allowed to produce; also, a limit on the total quantity of goods imported into a country.

### marketing board

An agricultural organization established to administer quotas and market the products of its producers.

### rent-control program

A government program that limits the amount landlords can increase rents.

### rent

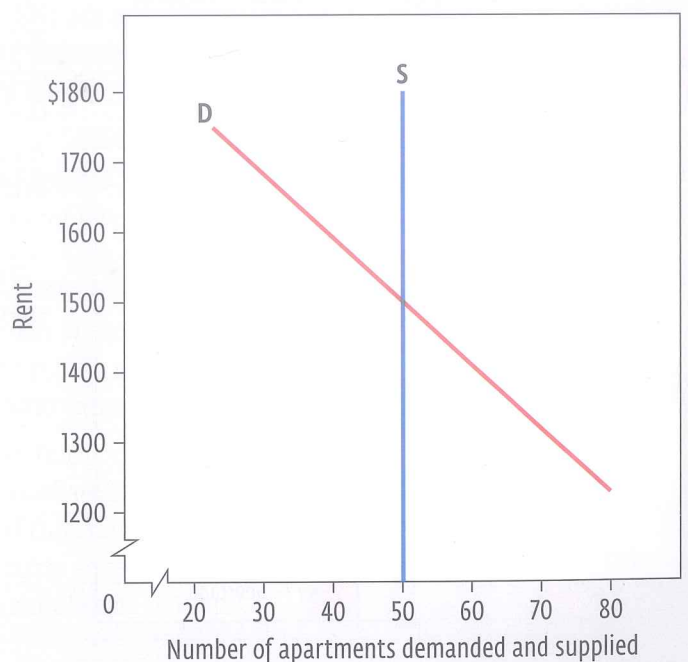
The price people pay for accommodation, determined by demand and supply for rental accommodation.

## Rent Controls

A **rent-control program** is a good example of a price ceiling. Most Canadian provinces and many American states have enacted such programs, and the controversy that surrounds them never seems to end. Let's use the tools of supply and demand to examine the rental market and the effects that controls have on it.

**Rent** is the price paid for accommodation and, like any other market price, it is determined by demand and supply. Figure 8.11 shows the rent the market sets for the quantity of apartments demanded and supplied in a particular building. At \$1 500 for a one-bedroom apartment, the owner will supply 50 apartments. We have made the supply curve vertical because the owner cannot increase supply immediately (because that would involve building more units). In other words, the supply of apartments is fixed, or *perfectly inelastic*, in the short term.

**FIGURE 8.11**  
How apartment rents are set





**wage**

The price a worker receives for supplying labour to a business with a demand for it.

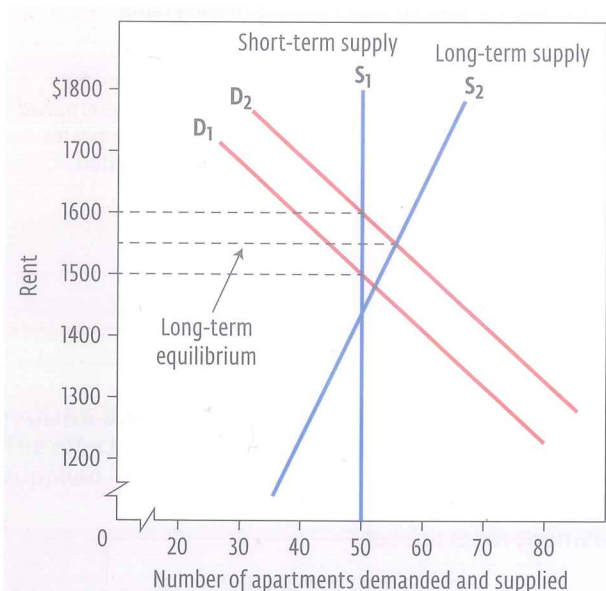
**minimum wage**

A government-established wage, higher than one set by the demand for, and supply of, workers.

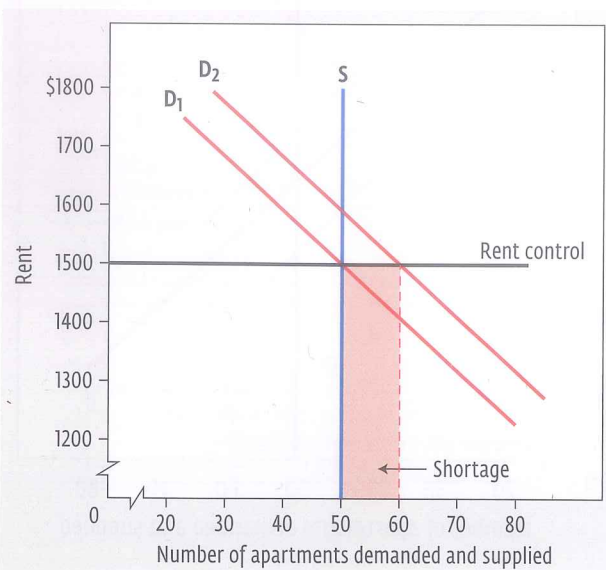
Suppose that an increase in renters occurs, shifting the demand curve upward. This change encourages owners to raise rents to \$1 600 a month. This increase in rent has two effects: those who can afford the higher rent will stay and pay, while those who cannot will have to find less expensive accommodation elsewhere.

Higher rents mean higher profits for the owner, who is therefore encouraged to build more units. Figure 8.12 illustrates the effect of this long-term decision to construct another apartment building: the supply curve shifts to the right. This long-run supply curve, with greater elasticity, also has beneficial effects for renters, as we can see from the graph. The supply of apartments increases, and the rental price, at least in theory, falls to \$1 550. This is the way a free rental market tends to work, and both renters and apartment owners appear to win in the long run.

**FIGURE 8.12**  
What happens to the rent of apartments when demand increases



**FIGURE 8.13**  
Rent controls and their effects

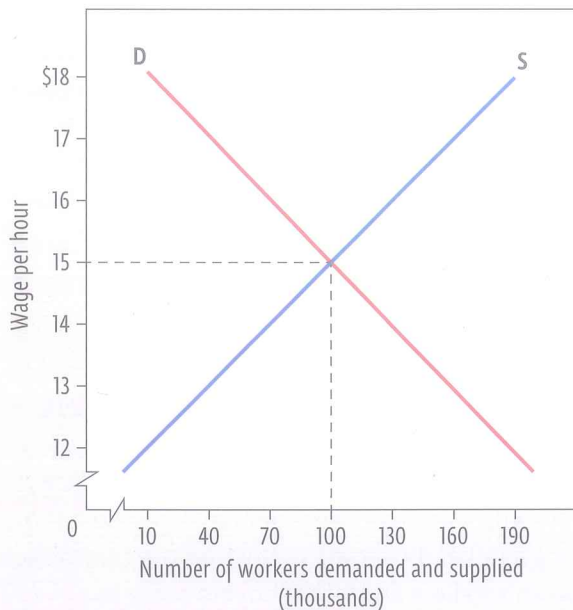


Now suppose that, in response to the increase in demand that caused rents to rise to \$1 600 in the short term, the government comes under pressure to alleviate the economic hardship renters are experiencing. The government introduces a rent-control program: a law that freezes, reduces, or controls the amount of rent that owners can charge. We will simplify the discussion at this point, and assume that a freeze on rent for one-bedroom apartments will be fixed at \$1 500. Figure 8.13 shows that if demand continues to rise to  $D_2$ , there will be a shortage of supply of 10 units.

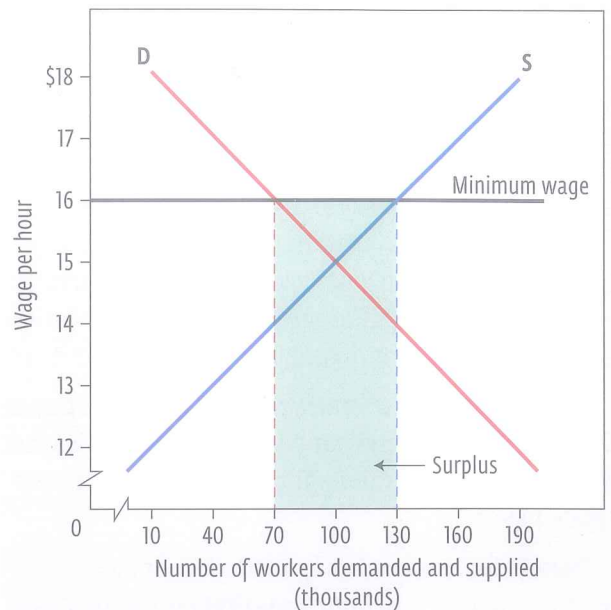
If this kind of shortage is repeated in buildings all over the city, people will have great difficulty finding essential accommodation. Those who are looking for an apartment will be tempted to offer building owners more money “under the table” in hopes of beating others to a vacancy. Owners, with no incentive to keep their buildings in good repair to attract new tenants, may stop making essential repairs and renovations. With rental prices fixed, they will also be disinclined to build more units.

The problems with rent controls have not prevented many cities throughout the world from using them.

**FIGURE 8.14**  
The labour market before minimum wage



**FIGURE 8.15**  
The labour market after the government sets a minimum wage



## Minimum Wages

Rent controls are an example of how governments intervene in markets to establish a ceiling price when they think the price that sellers are receiving for their product is too high. As we stated before, governments also intervene to establish floor prices when they believe the price sellers are receiving is too low. A **wage** is the price a worker receives for supplying labour to a business with a demand for it. In Figure 8.14, we see that 100 000 workers are receiving wages of \$15 an hour. Suppose that the government responds to public pressure to raise the low wages of these workers by setting a **minimum wage**, a wage that is higher than the one set by the forces of demand and supply.

We can see the results of the government's move in Figure 8.15. The minimum wage is set at \$16 an hour. Businesses adjust to this by employing only 70 000 workers, 30 000 fewer than at the old wage rate of \$15 an hour. Furthermore, the higher wage rate attracts an additional 30 000 workers into the labour market, for a total of 130 000 workers who are willing to work for \$16 an hour. If businesses are willing to hire only 70 000 workers, this means the minimum wage has created an unemployment problem: 60 000 workers who cannot find jobs.

As noted earlier, floor prices tend to create surpluses. In the case of minimum wages, they create surpluses of potential workers who cannot find jobs. On the other hand, the minimum wage increases the wages of thousands of people at the low end of the wage scale. These people receive a more substantial paycheque than they would have if wages had been set solely by supply and demand.

## Self-Reflect

- 1 Define and state the purpose of a ceiling price. What problems can it cause?
- 2 Define and state the purpose of a floor price. What problems can it cause?
- 3 What effects do subsidies and quotas have on the market for a good?
- 4 What kind of government intervention is a rent-control program? What effect might it have on the rental market?
- 5 What kind of government intervention is a minimum-wage law? What effect might it have on the labour market?



# Thinking like an Economist

## The Economics of Ticket Reselling

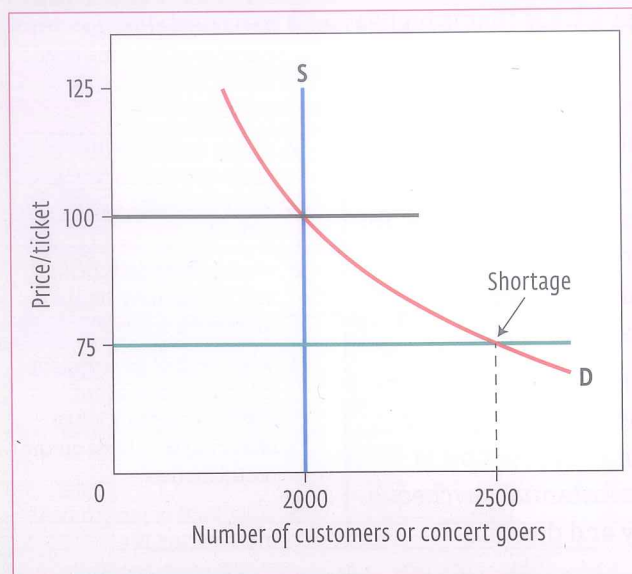
Have you ever been to a concert or sporting event and witnessed individuals reselling tickets to the event? Have you ever seen tickets available to purchase online at a cost that exceeds the original price? Often referred to as "scalping" or "ticket brokering," the act of reselling event tickets is controversial. Many believe that ticket resellers are profiting at the expense of the event organizers, the artists, and fans.

How do economists analyze this practice? They use the same demand and supply tools you have learned in this chapter to understand the issues that ticket resale raises.

Tickets for a concert or sporting event are sold in what is called a **primary market**. Fans buy their tickets online, over the phone, or in person. Figure 8.16 shows the demand and supply of tickets for a concert by a top performer. Suppose that the top performer can easily fill a 2 000-seat concert hall. (Notice that the supply curve is vertical because there is only one performer.) The concert organizers price tickets at \$75 apiece.

**FIGURE 8.16**  
Demand for, and supply of, concert tickets

The result? Ticket resale.



If the ticket price is \$75, a full 2 500 fans would purchase tickets, but the hall holds only 2 000 people. Clearly, the price is too low, causing a shortage of 500 tickets. If the price per ticket were \$100, demand would equal supply, and no shortage would occur.

The opportunity to make a profit comes because those tickets are underpriced and undersupplied in relation to the demand for them. Ticket resellers, through various means, buy up tickets in the primary market and resell them at a higher price to people who want to attend, but have missed out on buying a ticket. Economists say that the transactions between resellers and ticket buyers occur in a **secondary market**.

If the problem is that the price per ticket is too low, then why don't event organizers raise prices to eliminate shortages? One theory is that event organizers believe that attendees enjoy the concert or sporting event more when the hall or stadium is full. Higher prices might discourage fans and leave empty seats. Another theory is that some artists, out of a sense of fairness, want average-income fans to be able to afford to attend their concerts. These theories are possibilities, but a little research indicates that Bruce Springsteen, Adele, Taylor Swift, and Radiohead, among many others, are very vocal in their dislike of ticket reselling. There may be self-interest in not alienating average people who listen to their music—by charging more and thereby reducing reselling. This is a debatable issue for sure. Event organizers also know that if prices are too high, fans have less to spend on profitable refreshments and merchandise sold at the event.

### primary market

The first time a ticket is sold for an event by an event organizer such as Ticketmaster.

### secondary market

The reselling of tickets bought from buyers in the primary market at a higher price than the stated ticket price.



Four approaches to the ticket reselling issue are worth considering:

- 1 Recognize that reselling often occurs because of faulty pricing. If tickets are priced high enough, shortages won't occur. Reselling "helps" people who missed out in the primary market fulfill their demand — albeit for a higher price.
- 2 Limit the profits resellers can make by setting a fixed percentage limit above the ticket price (say 50 percent) resellers can charge.
- 3 Try to prevent ticket reselling by printing the names and birth dates of ticket buyers on all tickets sold.
- 4 Forbid reselling and secondary markets in tickets.

## APPLYING ECONOMIC THINKING

- 1 What might performers do on the supply side to reduce ticket reselling?
- 2 Who wins or loses from raising average ticket prices at events?
- 3 Which of the four approaches do you support?

## DID YOU KNOW?

"Scalping bots" are computer programs that facilitate the rapid purchase of large numbers of tickets from event sites such as Ticketmaster before other people can buy them. They are illegal in Canada and in many US states, but it is hard to stop bots from being used in other countries, such as Panama and Gibraltar, although at the time of writing, class-action lawsuits were being initiated in both Canada and the United States.

