CHAPTER 3

Individual Markets

Demand and Supply

ACCORDING TO AN old joke, if you teach a parrot to say "demand and supply," you have an economist. There is an element of truth in this quip. The tools of demand and supply can take us far in understanding both specific economic issues and how the entire economy works. 3.1 ■ With our circular flow model in Chapter 2, we identified the participants in the product market and resource market. We asserted that prices are determined by the "interaction" between buyers and sellers in those markets. In this chapter we examine that interaction in detail and explain how prices and output quantities are determined.

▮ Markets

Recall from Chapter 2 that a **market** is *an institution or mechanism that brings together buyers ("demanders") and sellers ("suppliers") of particular goods, services, or resources.* Markets exist in many forms. The corner gas station, e-commerce sites, 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, livestock, used farm equipment, and, sometimes, real estate. In labor markets, the quarterback and his agent bargain with the owner of an NFL team. A graduating finance major interviews with Citicorp or Wells Fargo at the university placement office.

All situations that link potential buyers with potential sellers are markets. 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 impersonal, with buyer and seller never seeing or knowing each other.

To keep things simple, we will focus in this chapter on markets consisting of large numbers of independently acting buyers and sellers of standardized products. These are the highly competitive markets such as a central grain exchange, a stock market, or a market for foreign currencies in which the price is "discovered" through the interacting decisions of buyers and sellers. They are *not* the markets in which one or a handful of producers "set" prices, such as the markets for commercial airplanes or operating software for personal computers.

Demand

Demand is *a schedule or a curve that shows the various amounts of a product that consumers are willing and able to purchase at each of a series of possible prices during a specified period of time.*[1] Demand shows the quantities of a product that will be purchased at various possible prices, *other things equal.* Demand can easily be shown in table form. Table 3.1 is a hypothetical **demand schedule** for a *single consumer* purchasing bushels of corn.

Table 3.1 reveals the relationship between the various prices of corn and the quantity of corn a particular consumer would be willing and able to purchase at each of these prices. We say "willing and able" because willingness alone is not effective in the market. You may be willing to buy a digital camera, but if that willingness is not backed by the necessary dollars, it will not be effective and, therefore, will not be reflected in the market. In Table 3.1, if the price of corn were $5 per bushel, our consumer would be willing and able to buy 10 bushels per week; if it were $4, the consumer would be willing and able to buy 20 bushels per week; and so forth.

Table 3.1 does not tell us which of the five possible prices will actually exist in the corn market. That depends on 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. Saying "A consumer will buy 10 bushels of corn at $5 per bushel" is meaningless. Saying "A consumer will buy 10 bushels of corn per week at $5 per bushel" is meaningful. Unless a specific time period is stated, we do not know whether the demand for a product is large or small.

Table 3.1
An Individual Buyer's Demand for Corn

Price per Bushel	Quantity Demanded per Week
$5	10
4	20
3	35
2	55
1	80

[1]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."

Law of Demand

A fundamental characteristic of demand is this: *All else equal, as price falls, the quantity demanded rises, and as price rises, the quantity demanded falls.* In short, there is a negative or *inverse* relationship between price and quantity demanded. Economists call this inverse relationship the **law of demand.** 3.2

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 Nikes purchased will depend not only on the price of Nikes but also on the prices of such substitutes as Reeboks, Adidas, and Filas. The law of demand in this case says that fewer Nikes will be purchased if the price of Nikes rises *and if the prices of Reeboks, Adidas, and Filas all remain constant.* In short, if the *relative price* of Nikes rises, fewer Nikes will be bought. However, if the price of Nikes and the prices of all other competing shoes increase by some amount—say, $5—consumers might buy more, less, or the same amount of Nikes.

Why the inverse relationship between price and quantity demanded? Let's look at three explanations, beginning with the simplest one:

- The law of demand is consistent with common sense. 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 price obstacle, the more they will buy. The fact that businesses have "sales" is evidence of their belief in the law of demand.
- In any specific time period, each buyer of a product will derive less satisfaction (or benefit, or utility) from each successive unit of the product consumed. The second Big Mac will yield less satisfaction to the consumer than the first, and the third still less than the second. That is, consumption is subject to **diminishing marginal utility.** And because successive units of a particular product yield less and less marginal utility, consumers will buy additional units only if the price of those units is progressively reduced. 3.3
- We can also explain the law of demand in terms of income and substitution effects. The **income effect** indicates that a lower price increases the purchasing power of a buyer's money income, enabling the buyer to purchase more of the product than she or he could buy before. A higher

price has the opposite effect. The **substitution effect** suggests that at a lower price buyers have the incentive to substitute what is now a less expensive product for similar products that are now *relatively* more expensive. The product whose price has fallen is now "a better deal" relative to the other products.

For example, a decline in the price of chicken will increase the purchasing power of consumer incomes, enabling people to buy more chicken (the income effect). At a lower price, chicken is relatively more attractive and consumers tend to substitute it for pork, mutton, beef, and fish (the substitution effect). The income and substitution effects combine to make consumers able and willing to buy more of a product at a low price than at a high price. 3.4

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 Table 3.1 and connected the points with a smooth curve, labeled *D*. Such a curve is called a **demand curve.** Its downward slope reflects the law of demand—people buy more of a product, service, or resource as its price falls. The relationship between price and quantity demanded is inverse.

Table 3.1 and Figure 3.1 contain exactly the same data and reflect the same relationship between price and quantity demanded. But the graph shows that relationship more simply and clearly than a table or a description in words.

Market Demand

So far, we have concentrated on just one consumer. 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, as represented in Table 3.2, it is relatively easy to determine the total quantity demanded at each price. Figure 3.2 shows the graphical summing procedure: At each price we add the individual quantities demanded to obtain the total quantity demanded at that price; we then plot the price and the total quantity demanded as one point of the market demand curve.

Competition, of course, ordinarily entails many more than three buyers of a product. To avoid hundreds or thousands or millions of additions, we suppose that all the buyers in a market are willing and able to buy the same amounts at each of the possible prices. Then we just multiply those amounts by the number of buyers to obtain the market demand. This is the way we arrived at curve D_1 in Figure 3.3, for a market with 200 corn buyers whose demand is

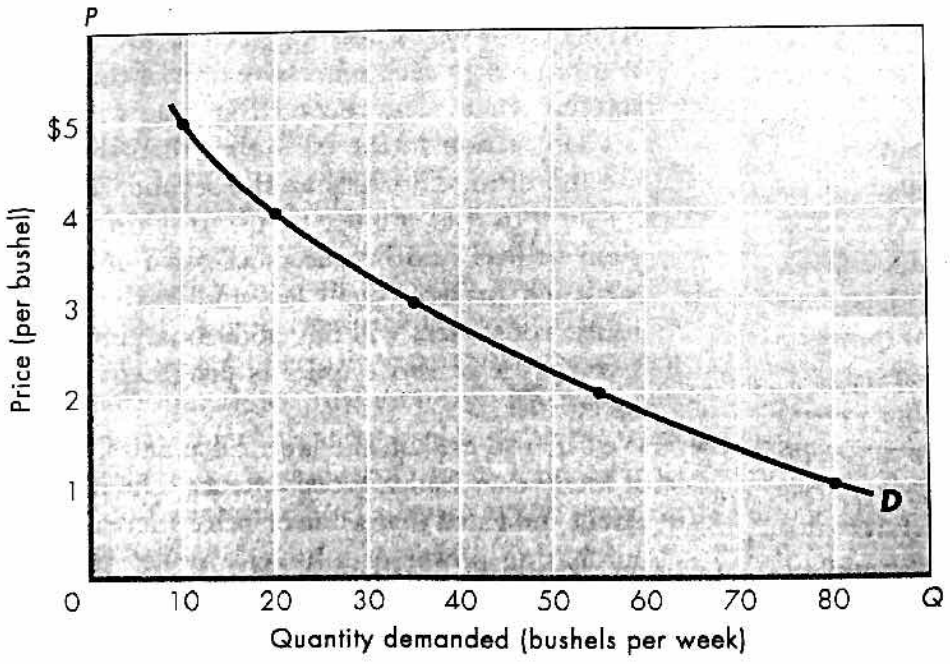

Figure 3.1

An individual buyer's demand for corn. Because price and quantity demanded are inversely related, an individual's demand schedule graphs as a downsloping curve such as *D*. Specifically, the law of demand says that, other things equal, consumers will buy more of a product as its price declines. Here and in later figures, *P* stands for price, and *Q* stands for quantity (either demanded or supplied).

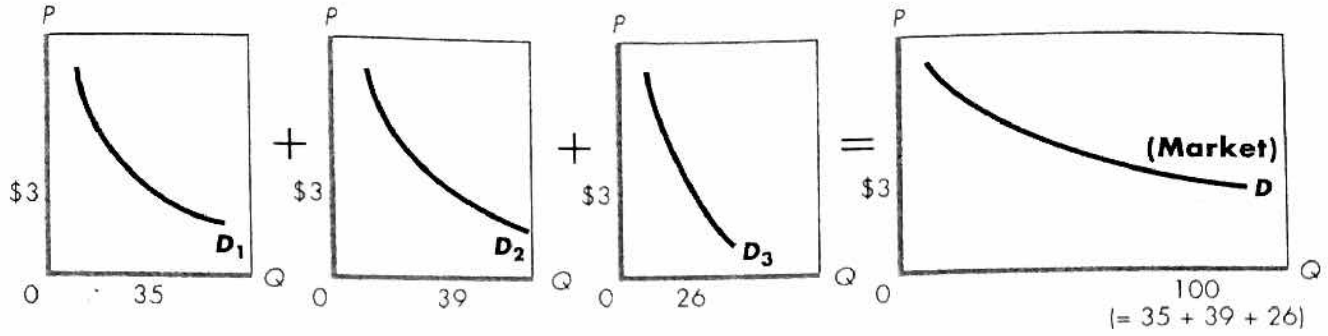

Figure 3.2

Market demand for corn, 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 bushels.

that shown in Table 3.1. Table 3.3 shows the calculations.

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 assumed to be 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) consumer expectations about future prices and incomes.

Change in Demand

A change in one or more of the determinants of demand will change the demand data (the demand schedule) in Table 3.3 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 corn at each possible price than is reflected in column 4 in Table 3.3, 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 less corn at each possible price than is indicated in column 4, Table 3.3. 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.

Table 3.2

Market Demand for Corn, Three Buyers

Price per Bushel	Quantity Demanded: First Buyer		Second Buyer		Third Buyer		Total Quantity Demanded per Week
$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

Table 3.3

Market Demand for Corn, 200 Buyers

(1) Price per Bushel	(2) Quantity Demanded per Week, Single Buyer		(3) Number of Buyers in the Market		(4) Total Quantity Demanded per Week
$5	10	×	200	=	2,000
4	20	×	200	=	4,000
3	35	×	200	=	7,000
2	55	×	200	=	11,000
1	80	×	200	=	16,000

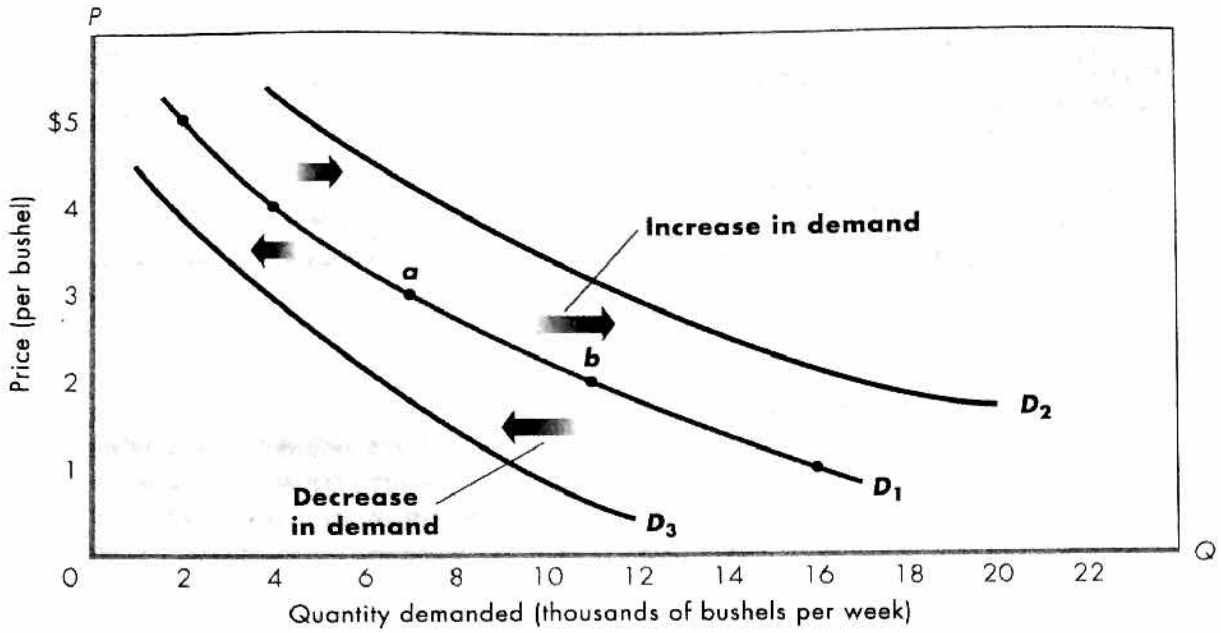

Figure 3.3

Changes in the demand for corn. 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.

Tastes A favorable change in consumer tastes (preferences) for a product—a change that makes the product more desirable—means that more of it will be demanded at each price. Demand will increase; the demand curve will shift rightward. An unfavorable change in consumer preferences will decrease demand, shifting the demand curve to the left.

New products may affect consumer tastes; for example, the introduction of compact discs greatly decreased the demand for cassette tapes. Consumers' concern over the health hazards of cholesterol and obesity have increased the demand for broccoli, low-calorie sweeteners, and fresh fruit while decreasing the demand for beef, veal, eggs, and whole milk. Over the past several years, the demand for coffee drinks, bottled water, and sports utility vehicles has greatly increased, driven by a change in tastes. So, too, has the demand for leather jackets and fleece outerwear.

Number of Buyers An increase in the number of buyers in a market increases demand. A decrease in the number of buyers in a market decreases demand. For example, improvements in communications have given financial markets international range and have thus increased the demand for stocks and bonds. And the baby boom after the Second World War increased demand for diapers, baby lotion, and the services of obstetricians. When the baby boomers reached their twenties in the 1970s, the demand for housing increased. Conversely, the aging of the baby boomers in the 1980s and 1990s was a factor in the relative slump in the demand for housing in those decades. Also, an increase in life expectancy has increased the demand for medical care, retirement communities, and nursing homes. And international trade agreements have reduced foreign trade barriers to American farm commodities, thus increasing the demand for those products.

Income How changes in income affect demand is a more complex matter. For most products, a rise in income causes an increase in demand. Consumers typically buy more steaks, furniture, and computers as their incomes increase. Conversely, the demand for such products declines as their incomes fall. Products whose demand varies *directly* with money income are called *superior goods*, or **normal goods.**

Although most products are normal goods, there are some exceptions. As incomes increase beyond some point, the demand for used clothing, retread

tires, and third-hand automobiles may decrease, because the higher incomes enable consumers to buy new versions of those products. Rising incomes may also decrease the demand for soy-enhanced hamburger. Similarly, rising incomes may cause the demand for charcoal grills to decline as wealthier consumers switch to gas grills. Goods whose demand varies *inversely* with money income are called **inferior goods.**

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.

Substitutes

Beef and chicken are examples of substitute goods or, simply, *substitutes.* When the price of beef rises, consumers buy less beef, increasing the demand for chicken. Conversely, as the price of beef falls, consumers buy more beef, decreasing the demand for chicken. *When two products are substitutes, the price of one and the demand for the other move in the same direction.* So it is with pairs such as Nikes and Reeboks, Colgate and Crest, Toyotas and Hondas, and Coke and Pepsi. So-called *substitution in consumption* occurs when the price of one good rises relative to the price of a similar good.

Complements

Complementary goods (or, simply, *complements*) are goods that are used together and are usually demanded together. If the price of gasoline falls and, as a result, you drive your car more often, the extra driving increases your demand for motor oil. Thus, gas and motor oil are jointly demanded; they are complements. So it is with ham and eggs, tuition and textbooks, movies and popcorn, cameras and film. *When two products are complements, the price of one good and the demand for the other good move in opposite directions.*

Unrelated Goods

The vast majority of goods that are not related to one another are called *independent goods.* Examples are butter and golf balls, potatoes and automobiles, and bananas and wristwatches. A change in the price of one does not affect the demand for the other.

Expectations

Changes in consumer expectations may shift demand. A newly formed expectation of higher future prices may cause consumers to buy now in order to "beat" the anticipated price rises, thus increasing current demand. For example, when freezing weather destroys much of Florida's citrus crop, consumers may reason that the price of orange juice will rise. They may stock up on orange juice by purchasing large quantities now. In contrast, a newly formed expectation of falling prices or falling income may decrease current demand for products.

Similarly, a change in expectations relating to future product availability may affect current demand. In late December 1999 there was a substantial increase in the demand for gasoline. Reason? Motorists became concerned that the Y2K computer problem might disrupt fuel pumps or credit card systems.

Finally, a change in expectations concerning future income may prompt consumers to change their current spending. For example, first-round NFL draft choices may splurge on new luxury cars in anticipation of a lucrative professional football contract. Or workers who become fearful of losing their jobs may reduce their demand for, say, vacation travel.

In summary, an *increase* in demand—the decision by consumers to buy larger quantities of a product at each possible price—may be caused by:

- A favorable change in consumer tastes.
- An increase in the number of buyers.
- Rising incomes if the product is a normal good.
- Falling incomes if the product is an inferior good.
- An increase in the price of a substitute good.
- A decrease in the price of a complementary good.
- A new consumer expectation that either prices or income will be higher in the future.

You should "reverse" these generalizations to explain a *decrease* in demand. Table 3.4 provides additional illustrations of the determinants of demand. **(Key Question 2)**

Changes in Quantity Demanded

A *change in demand* must not be confused with a *change in quantity demanded.* A **change in demand** is a shift of the entire demand curve to the right (an increase in demand) or to the left (a decrease in

Table 3.4
Determinants of Demand: Factors That Shift the Demand Curve

Determinant	Examples
Change in buyer tastes	Physical fitness rises in popularity, increasing the demand for jogging shoes and bicycles; Latin American music becomes more popular, increasing the demand for Latin CDs.
Change in number of buyers	A decline in the birthrate reduces the demand for childrens' toys.
Change in income	A rise in incomes increases the demand for such normal goods as butter, lobster, and filet mignon while reducing the demand for such inferior goods as cabbage, turnips, and inexpensive wine.
Change in the prices of related goods	A reduction in airfares reduces the demand for bus transportation (substitute goods); a decline in the price of compact disc players increases the demand for compact discs (complementary goods).
Change in expectations	Inclement weather in South America creates an expectation of higher future prices of coffee beans, thereby increasing today's demand for coffee beans.

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 entire schedule and a shift of the entire 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 schedule or demand curve. The cause of such a change is an increase or decrease in the price of the product under consideration. In Table 3.3, for example, a decline in the price of corn from \$5 to \$4 will increase the quantity of corn demanded from 2000 to 4000 bushels.

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.*

QUICK REVIEW 3.1

- A market is any arrangement that facilitates the purchase and sale of goods, services, or resources.
- Demand is a schedule or a curve showing the amount of a product that buyers are willing and able to purchase, in a particular time period, at each possible price in a series of prices.
- The law of demand states that, other things equal, the quantity of a good purchased varies inversely with its price.
- The demand curve shifts because of changes in (a) consumer tastes, (b) the number of buyers in the market, (c) consumer income, (d) the prices of substitute or complementary goods, and (e) consumer expectations.
- A change in demand is a shift of the entire demand curve; a change in quantity demanded is a movement from one point to another on a demand curve.

Supply

Supply is *a schedule or curve showing the amounts of a product that producers are willing and able to make available for sale at each of a series of possible prices during a specific period.*[2] Table 3.5 is a hypothetical **supply schedule** for a single producer of corn. It shows the quantities of corn that will be supplied at various prices, other things equal.

Table 3.5
An Individual Producer's Supply of Corn

Price per Bushel	Quantity Supplied per Week
\$5	60
4	50
3	35
2	20
1	5

[2]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."

Law of Supply

Table 3.5 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 tells us that firms will produce and 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, who is on the paying end. The higher the price, the less the consumer will buy. But the supplier is on the receiving end of the product's price. To a supplier, price represents *revenue*, which serves as an incentive to produce and sell a product. The higher the price, the greater this incentive and the greater the quantity supplied.

Consider a farmer who can shift resources among alternative products. As price moves up, as shown in Table 3.5, the farmer finds it profitable to take land out of wheat, oats, and soybean production and put it into corn. And the higher corn prices enable the farmer to cover the increased costs associated with more intensive cultivation and the use of more seed, fertilizer, and pesticides. The overall result is more corn.

Now consider a manufacturer. Beyond some quantity of production, manufacturers usually encounter increasing costs per added unit of output. Certain productive resources—in particular, the firm's plant and machinery—cannot be expanded quickly, so the firm uses more of other resources, such as labor, to produce more output. But as time passes, the existing plant becomes increasingly crowded and congested. As a result, each added worker produces less added output, and the cost of successive units of output rises accordingly. The firm will not produce the more costly units unless it receives a higher price for them. Again, price and quantity supplied are directly related.

The Supply Curve

As with demand, it is convenient to represent supply graphically. In Figure 3.4, curve S_1 is a graph of the market supply data given in Table 3.6. Those data assume there are 200 suppliers in the market,

Table 3.6

Market Supply of Corn, 200 Producers

(1) Price per Bushel	(2) Quantity Supplied per Week, Single Producer		(3) Number of Sellers in the Market		(4) Total Quantity Supplied per Week
$5	60	×	200	=	12,000
4	50	×	200	=	10,000
3	35	×	200	=	7,000
2	20	×	200	=	4,000
1	5	×	200	=	1,000

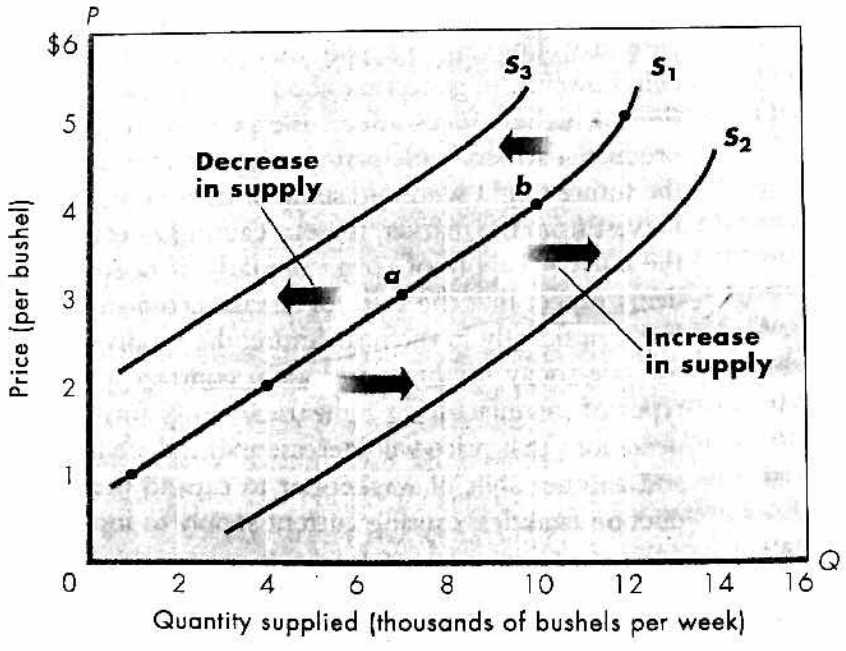

Figure 3.4

Changes in the supply of corn. 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 a fixed supply curve.

each willing and able to supply corn according to Table 3.5. We obtain the market **supply curve** by horizontally adding the supply curves of the individual producers. Note that the axes in Figure 3.4 are the same as those used in our graph of market demand (Figure 3.3), except for the change from "quantity demanded" to "quantity supplied" on the horizontal axis.

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.

The basic **determinants of supply** are (1) resource prices, (2) technology, (3) taxes and subsidies, (4) prices of other goods, (5) price expectations, 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 3.4, 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 in profits reduces the incentive for firms to supply output at each product price. For example, an increase in the prices of iron ore and coke will increase the cost of producing steel and reduce its 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 seed and fertilizer will increase the supply of corn.

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: Recent improvements in the fuel efficiency of aircraft engines have reduced the cost of providing passenger air service. Thus, airlines now offer more flights than previously at each ticket price; the supply of air service has increased.

Taxes and Subsidies Businesses treat most taxes as costs. An increase in sales or property 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 sometimes 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 the prices of basketballs and volleyballs decline relative to the price of soccer balls, producers of those goods may decide to produce more soccer balls instead, increasing their supply.

Price Expectations 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 corn price in the future might withhold some of their current corn harvest from the market, thereby causing a decrease in the current supply of corn. Similarly, if people suddenly expect that the price of Amazon.com stock will rise significantly in the near future, the supply offered for sale today might decrease. 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 mar-

ket 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.

Table 3.7 is a checklist of the determinants of supply, along with further illustrations. **(Key Question 5)**

Table 3.7

Determinants of Supply: Factors That Shift the Supply Curve

Determinant	Examples
Change in resource prices	A decrease in the price of microchips increases the supply of computers; an increase in the price of crude oil reduces the supply of gasoline.
Change in technology	The development of more effective wireless technology increases the supply of cell phones.
Changes in taxes and subsidies	An increase in the excise tax on cigarettes reduces the supply of cigarettes; a decline in subsidies to state universities reduces the supply of higher education.
Change in prices of other goods	An increase in the price of cucumbers decreases the supply of watermelons.
Change in expectations	An expectation of a substantial rise in future log prices decreases the supply of logs today.
Change in number of suppliers	An increase in the number of Internet service providers increases the supply of such services; the formation of women's professional basketball leagues increases the supply of women's professional basketball games.

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 supply is a schedule or curve, a **change in supply** means a change in the entire schedule and a shift of the entire 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 Table 3.6, a decline in the price of corn from $5 to $4 decreases the quantity of corn supplied per week from 12,000 to 10,000 bushels. This 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 price changes.*

QUICK REVIEW 3.2

- A supply schedule or curve shows that, other things equal, the quantity of a good supplied varies directly with its price.
- The supply curve shifts because of changes in (a) resource prices, (b) technology, (c) taxes or subsidies, (d) prices of other goods, (e) expectations of future prices, and (f) the number of suppliers.
- A change in supply is a shift of the supply curve; a change in quantity supplied is a movement from one point to another on a fixed supply curve.

Supply and Demand: Market Equilibrium

We can now bring together supply and demand to see how the buying decisions of households and the selling decisions of businesses interact to determine the price of a product and the quantity actually bought and sold. In Table 3.8, columns 1 and 2 repeat the market supply of corn (from Table 3.6), and columns 2 and 3 repeat the market demand for corn (from Table 3.3). We assume that this is a competitive market—neither buyers nor sellers can set the price.

Table 3.8

Market Supply of and Demand for Corn

(1) Total Quantity Supplied per Week	(2) Price per Bushel	(3) Total Quantity Demanded per Week	(4) Surplus (+) or Shortage (−)*
12,000	$5	2,000	+10,000 ↓
10,000	4	4,000	+6,000 ↓
7,000	***3***	***7,000***	***0***
4,000	2	11,000	−7,000 ↑
1,000	1	16,000	−15,000 ↑

*Arrows indicate the effect on price.

Surpluses

We have limited our example to only five possible prices. Of these, which will actually prevail as the market price for corn? We can find an answer through trial and error. For no particular reason, let's start with $5. We see immediately that this cannot be the prevailing market price. At the $5 price, producers are willing to produce and offer for sale 12,000 bushels of corn, but buyers are willing to buy only 2000 bushels. The $5 price encourages farmers to produce lots of corn but discourages most consumers from buying it. The result is a 10,000-bushel **surplus** or *excess supply* of corn. This surplus, shown in column 4 of Table 3.8, is the excess of quantity supplied over quantity demanded at $5. Corn farmers would find themselves with 10,000 unsold bushels of output.

A price of $5, even if it existed temporarily in the corn market, could not persist over a period of time. The very large surplus of corn would prompt competing sellers to lower the price to encourage buyers to take the surplus off their hands.

Suppose the price goes down to $4. The lower price encourages consumers to buy more corn and, at the same time, induces farmers to offer less of it for sale. The surplus diminishes to 6000 bushels. Nevertheless, since there is still a surplus, competition among sellers will once again reduce the price. Clearly, then, the prices of $5 and $4 will not survive because they are "too high." The market price of corn must be less than $4.

Shortages

Let's jump now to $1 as the possible market price of corn. Observe in column 4 of Table 3.8 that at this price, quantity demanded exceeds quantity supplied by 15,000 units. The $1 price discourages farmers from devoting resources to corn production and encourages consumers to attempt to buy more than is available. The result is a 15,000-bushel **shortage** of, or *excess demand* for, corn. The $1 price cannot persist as the market price. Many consumers who want to buy at this price will not get corn. They will express a willingness to pay more than $1 to get some of the available output. Competition among these buyers will drive up the price to something greater than $1.

Suppose the competition among buyers boosts the price to $2. This higher price will reduce, but will not eliminate, the shortage of corn. For $2, farmers devote more resources to corn production, and some buyers who were willing to pay $1 per bushel will not want to buy corn at $2. But a shortage of 7000 bushels still exists at $2. This shortage will push the market price above $2.

Equilibrium Price and Quantity

By trial and error we have eliminated every price but $3. At $3, *and only at this price*, the quantity of corn that farmers are willing to produce and supply is identical with the quantity consumers are willing and able to buy. There is neither a shortage nor a surplus of corn at that price.

With no shortage or surplus at $3, there is no reason for the price of corn to change. Economists call this price the *market-clearing* or **equilibrium price,** "equilibrium" meaning "in balance" or "at rest." At $3, quantity supplied and quantity demanded are in balance at the **equilibrium quantity** of 7000 bushels. So $3 is the only stable price of corn under the supply and demand conditions shown in Table 3.8.

The price of corn, or of any other product bought and sold in competitive markets, will be established where the supply decisions of producers and the demand decisions of buyers are mutually consistent. Such decisions are consistent only at the equilibrium price (here, $3) and equilibrium quantity (here, 7000 bushels). At any higher price, suppliers want to sell more than consumers want to buy and a surplus results; at any lower price, consumers want to buy more than producers make available for sale and a shortage results. Such discrepancies between the supply and demand intentions of sellers and buyers then prompt price changes that bring the two sets of intentions into accord.

A graphical analysis of supply and demand should yield the same conclusions. **Figure 3.5 (Key**

KEY GRAPH

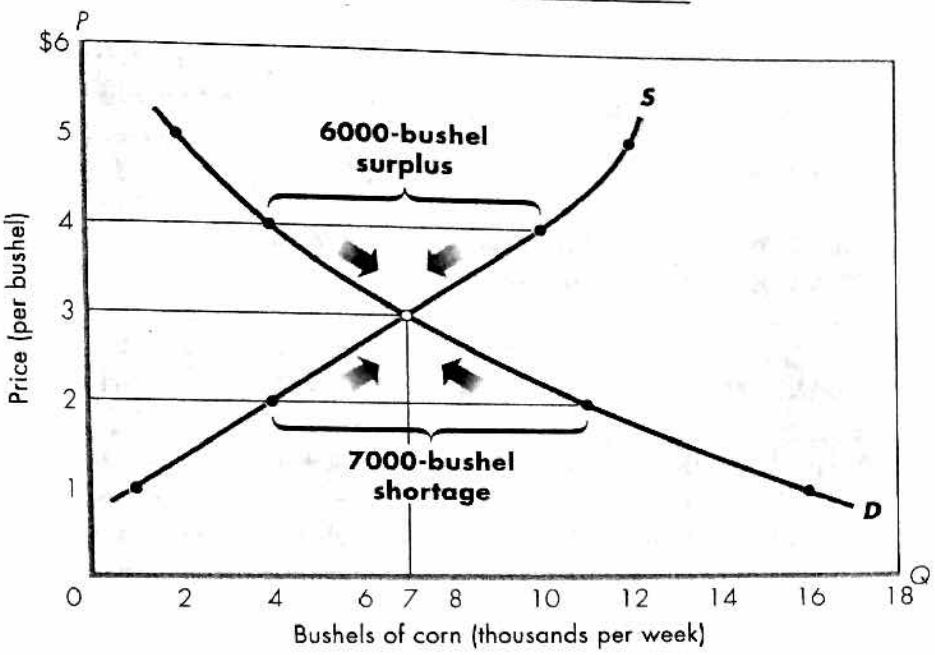

Figure 3.5

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 7000 bushels of corn. The shortages of corn at below-equilibrium prices (for example, 7000 bushels 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, 6000 bushels 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 corn.

Quick Quiz 3.5

1. Demand curve *D* is downsloping because:
- *a.* producers offer less of a product for sale as the price of the product falls.
- *b.* lower prices of a product create income and substitution effects that lead consumers to purchase more of it.
- *c.* the larger the number of buyers in a market, the lower the product price.
- *d.* price and quantity demanded are directly (positively) related.

2. Supply curve *S*:
- *a.* reflects an inverse (negative) relationship between price and quantity supplied.
- *b.* reflects a direct (positive) relationship between price and quantity supplied.
- *c.* depicts the collective behavior of buyers in this market.
- *d.* shows that producers will offer more of a product for sale at a low product price than at a high product price.

3. At the $3 price:
- *a.* quantity supplied exceeds quantity demanded.
- *b.* quantity demanded exceeds quantity supplied.
- *c.* the product is abundant and a surplus exists.
- *d.* there is no pressure on price to rise or fall.

4. At price $5 in this market:
- *a.* there will be a shortage of 10,000 units.
- *b.* there will be a surplus of 10,000 units.
- *c.* quantity demanded will be 12,000 units.
- *d.* quantity demanded will equal quantity supplied.

Answers: 1. b; 2. b; 3. d; 4. b

Graph) shows the market supply and demand curves for corn on the same graph. (The horizontal axis now measures both quantity demanded and quantity supplied.)

Graphically, the intersection of the supply curve and the demand curve for a product indicates the market equilibrium. Here, equilibrium price and quantity are $3 per bushel and 7000 bushels. At any above-equilibrium price, quantity supplied exceeds quantity demanded. This surplus of corn causes price reductions by sellers who are eager to rid themselves of their surplus. The falling price causes less corn to be offered and simultaneously encourages consumers to buy more. The market moves to its equilibrium.

Any price below the equilibrium price creates a shortage; quantity demanded then exceeds quantity supplied. Buyers try to obtain the product by offering to pay more for it; this drives the price upward toward its equilibrium level. The rising price simultaneously causes producers to increase the quantity

supplied and prompts many buyers to leave the market, thus eliminating the shortage. Again the market moves to its equilibrium. ☑ 3.1 ! 3.1

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 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 bushel of corn will obtain it; all buyers who cannot or will not pay $3 will go without corn. Similarly, all producers who are willing and able to offer corn for sale at $3 a bushel will sell it; all producers who cannot or will not sell for $3 per bushel will not sell their product. **(Key Question 7)**

Changes in Supply, Demand, and Equilibrium

We know that demand might change because of fluctuations in consumer tastes or incomes, changes in consumer expectations, or variations in the prices of related goods. Supply might change in response to changes in resource prices, technology, or taxes. What effects will such changes in supply and demand have on equilibrium price and quantity?

Changes in Demand

Suppose that supply is constant and demand increases, as shown in Figure 3.6a. 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 3.6b, reduces both equilibrium price and equilibrium quantity. (The value of graphical analysis is now apparent: We need not fumble with columns of figures to determine the outcomes; we need only compare the new and the old points of intersection on the graph.)

Changes in Supply

Now suppose that demand is constant but supply increases, as in Figure 3.6c. 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 3.6d, the equilibrium price rises while the 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 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 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 both increase price. Their combined effect is an increase in equilibrium price greater than that caused by either change separately. But their effect on 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.

Supply Increase; Demand Increase What if supply and demand both increase? 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.

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

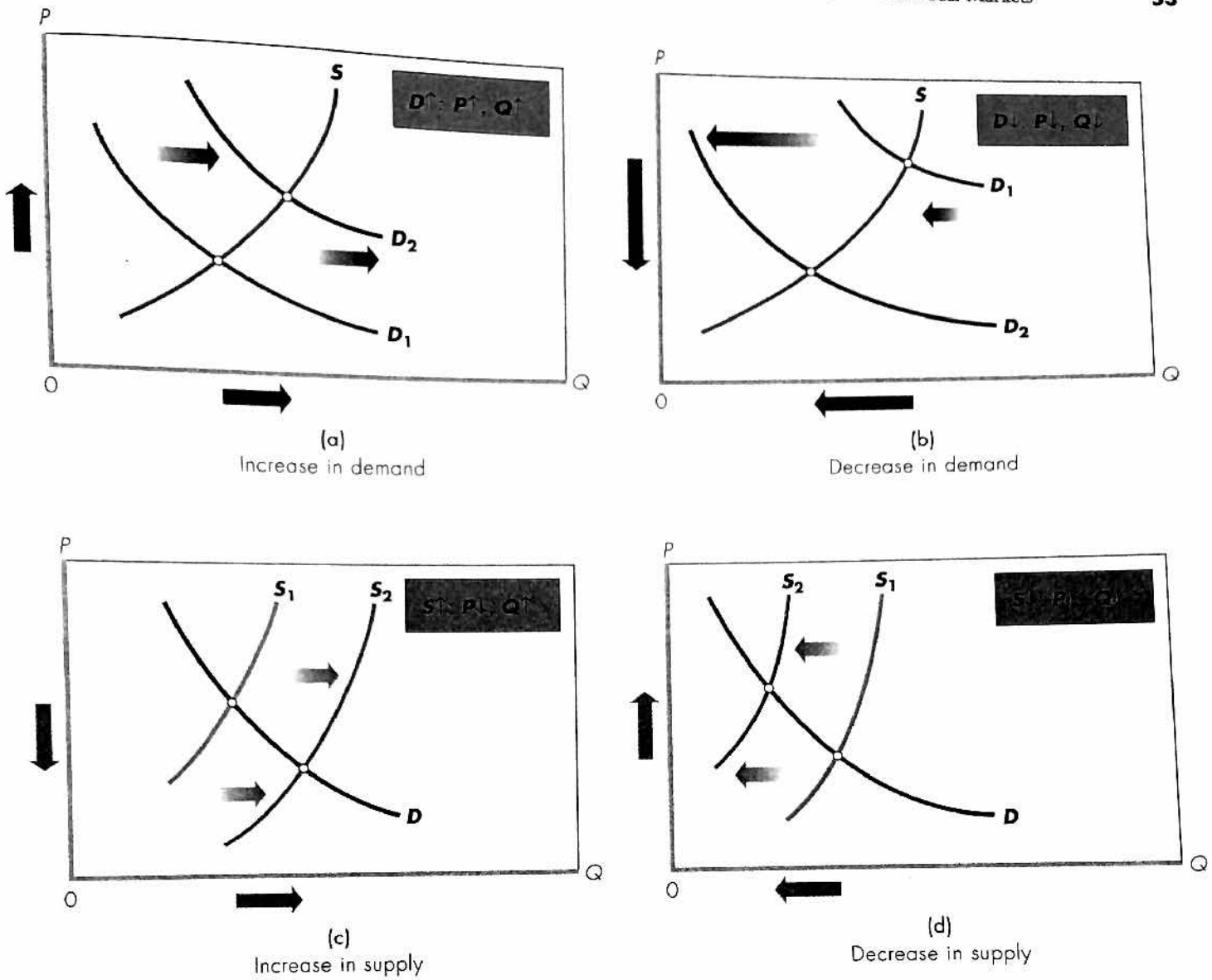

Figure 3.6

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_1 to D_2 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 decline in supply from S_1 to S_2 in (d) increases equilibrium price and decreases equilibrium quantity. The boxes in the top right corners summarize the respective changes and outcomes. The upward arrows in the boxes signify increases in demand (D), supply (S), equilibrium price (P), and equilibrium quantity (Q); the downward arrows signify decreases in these items.

Supply Decrease; Demand Decrease What about decreases in both supply and demand? 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. Because decreases in supply and in demand each reduce equilibrium quantity, we can be sure that equilibrium quantity will fall.

Table 3.9 summarizes these four cases. To understand them fully, you should draw supply and demand diagrams for each case to confirm the effects listed in Table 3.9.

Table 3.9

Effects of Changes in Both Supply and Demand

Change in Supply	Change in Demand	Effect on Equilibrium Price	Effect on Equilibrium Quantity
1. Increase	Decrease	Decrease	Indeterminate
2. Decrease	Increase	Increase	Indeterminate
3. Increase	Increase	Indeterminate	Increase
4. Decrease	Decrease	Indeterminate	Decrease

Special cases arise when a decrease in demand and a decrease in supply, or an increase in demand and an increase in supply, exactly cancel out. In both cases, the net effect on equilibrium price will be zero; price will not change. **(Key Question 8)**

A Reminder: "Other Things Equal"

We must stress once again that specific demand and supply curves (such as those in Figure 3.6) show relationships between prices and quantities demanded and supplied, *other things equal*. The downsloping demand curves tell us that price and quantity demanded are inversely related, other things equal. The upsloping supply curves imply that price and quantity supplied are directly related, other things equal.

If you forget the other-things-equal assumption, you can encounter situations that *seem* to be in conflict with these basic principles. For example, suppose salsa manufacturers sell 1 million bottles of salsa at $4 a bottle in 1 year; 2 million bottles at $5 in the next year; and 3 million at $6 in the year thereafter. Price and quantity purchased vary directly, and these data seem to be at odds with the law of demand. But there is no conflict here; the data do not refute the law of demand. The catch is that the law of demand's other-things-equal assumption has been violated over the 3 years in the example. Specifically, because of changing tastes and rising incomes, the demand for salsa has increased sharply, as in Figure 3.6a. The result is higher prices *and* larger quantities purchased.

Another example: The price of coffee occasionally has shot upward at the same time that the quantity of coffee produced has declined. These events seemingly contradict the direct relationship between price and quantity denoted by supply. The catch again is that the other-things-equal assumption underlying the upsloping supply curve was violated. Poor coffee harvests decreased supply, as in Figure 3.6d, increasing the equilibrium price of coffee and reducing the equilibrium quantity.

These examples emphasize the importance of our earlier distinction between a change in quantity demanded (or supplied) and a change in demand (supply). In Figure 3.6a a change in demand causes a change in the quantity supplied. In Figure 3.6d a change in supply causes a change in quantity demanded.

Application: Pink Salmon

To reinforce these ideas, let's briefly examine a real-world market: the market for pink salmon. This market has a standardized product, for which price has substantially declined in recent years.

A decade or two ago, fishers earned a relatively high price for each pound of pink salmon brought to the dock. In Figure 3.7 that price is represented as P_1, at the intersection of supply curve S_1 and demand curve D_1. The corresponding quantity of pink salmon—the type used mainly for canning—is represented as Q_1 pounds.

Over the past few decades, supply and demand shifted in the market for pink salmon. On the supply side, improved technology in the form of larger, more efficient fishing boats greatly increased the catch and lowered the cost of obtaining it. Also, high profits at price P_1 encouraged many new fishers to enter the industry. As a result of these changes, the supply of pink salmon greatly increased and the supply curve shifted to the right, as from S_1 to S_2 in Figure 3.7.

Over the same years, the demand for pink salmon decreased, as represented by the leftward shift from D_1 to D_2 in Figure 3.7. That decrease resulted from increases in consumer income and re-

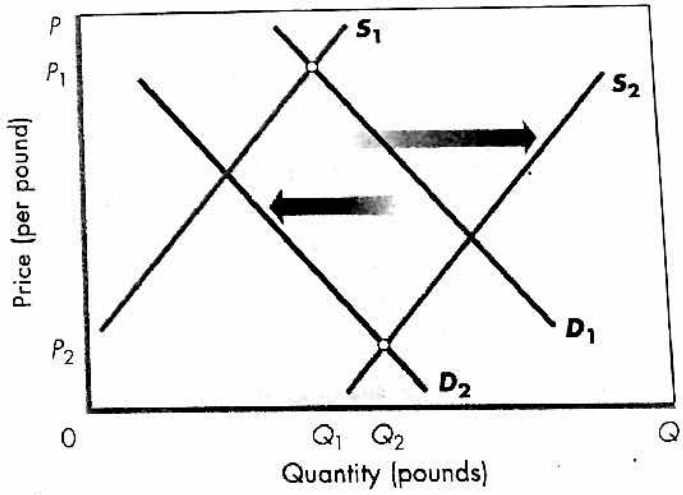

Figure 3.7

The market for pink salmon. In the last two decades, the supply of pink salmon has increased and the demand for pink salmon has decreased. As a result, the price of pink salmon has declined, here from P_1 to P_2 a pound. Since supply has increased more than demand has declined, the equilibrium quantity of pink salmon has increased, here from Q_1 to Q_2.

Ticket Scalping: A Bum Rap?

Some Market Transactions Get a Bad Name That Is Not Warranted.

Tickets to athletic and artistic events are sometimes resold at higher-than-original prices—a market transaction known by the term "scalping." For example, the original buyer may resell a $50 ticket to a college bowl game for $200, $250, or more. The media often denounce scalpers for "ripping off" buyers by charging "exorbitant" prices. Scalping and extortion are synonymous in some people's minds.

But is scalping really sinful? We must first recognize that such ticket resales are voluntary transactions. Both buyer and seller expect to gain from the exchange. Otherwise, it would not occur! The seller must value the $200 more than seeing the event, and the buyer must value seeing the event more than the $200. 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 value them less to those who value them more.

Does scalping impose losses or injury on other parties, in particular the sponsors of the event? If the sponsors are injured, it is because they initially priced tickets below the equilibrium level. In so doing, they suffer an economic loss in the form of less revenue and profit than they might have otherwise received. But the loss is self-inflicted because of their pricing error. That mistake is quite separate and distinct from the fact that some tickets are later resold at a higher price.

What about spectators? Does scalping deteriorate the enthusiasm of the audience? Usually not! People who have the greatest interest in the event will pay the scalper's high prices. Ticket scalping also benefits the teams and performing artists, because they will appear before more dedicated audiences—ones that are more likely to buy souvenir items or CDs.

So is ticket scalping undesirable? Not on economic grounds. Both seller and buyer of a "scalped" ticket benefit, and a more interested audience results. Event sponsors may sacrifice revenue and profits, but that stems from their own misjudgment of the equilibrium price.

ductions in the price of substitute products. As buyers' incomes increased, consumers shifted demand away from canned fish and toward higher-quality fresh or frozen fish, including higher-quality species of salmon such as Atlantic, Chinook, and Coho salmon. Moreover, the emergence of fish farming, in which salmon are raised in net pens, lowered the prices of these substitute species. That, too, reduced the demand for pink salmon.

The increased supply of, and decreased demand for, pink salmon greatly reduced the price, as represented by the drop from P_1 to P_2 in Figure 3.7. Both the supply increase and the demand decrease helped reduce the equilibrium price. However, the equilibrium *quantity* of pink salmon increased, as represented by the move from Q_1 to Q_2. Both shifts of the curves reduced the equilibrium price, but equilibrium quantity increased because the increase in supply exceeded the decrease in demand.

QUICK REVIEW 3.3

- In competitive markets, prices adjust to the equilibrium level at which quantity demanded equals quantity supplied.
- The equilibrium price and quantity are those indicated by the intersection of the supply and demand curves for any product or resource.
- An increase in demand increases equilibrium price and quantity; a decrease in demand decreases equilibrium price and quantity.
- An increase in supply reduces equilibrium price but increases equilibrium quantity; a decrease in supply increases equilibrium price but reduces equilibrium quantity.
- Over time, equilibrium price and quantity may change in directions that seem at odds with the laws of demand and supply because the other-things-equal assumption is violated.