

Supply and Demand: An Initial Look

In this chapter, we study the economist’s most basic investigative tool: the mechanism of supply and demand. Whether your Econ course concentrates on macroeconomics or microeconomics, you will find that the so-called law of supply and demand is a fundamental tool of economic analysis. Economists use supply and demand analysis to study issues as diverse as inflation and unemployment, the effects of taxes on prices, government regulation of business, and environmental protection. Supply and demand curves—graphs that relate price to quantity supplied and quantity demanded, respectively—show how prices and quantities are determined in a free market.¹

A major theme of the chapter is that governments around the world and throughout recorded history have tampered with the price mechanism. As we will see, these bouts with Adam Smith’s “invisible hand” have produced undesirable side effects that often surprised and dismayed the authorities. The invisible hand fights back!

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A SIMPLE BUT POWERFUL LESSON

¹ This chapter, like much of the rest of this book, uses many graphs like those described in the appendix to Chapter 1. If you have difficulties with these graphs, we suggest that you review that material before proceeding.



PUZZLE: *What Happened to Oil Prices?*

Since 1949, the dollars of purchasing power that a buyer had to pay to buy a barrel of oil has remained remarkably steady, and gasoline has continued to be a bargain. But there were two exceptional time periods—one from about 1975 through 1985, and one beginning in 2003—when oil prices exploded, and filling up the automobile gas tank became painful to consumers. Clearly, supply and demand changes must have been behind these developments. But what led them to change so much and so suddenly? Later in the chapter, we will provide excerpts from a newspaper story about the more recent oil crisis that describes some dramatic events behind suddenly shifting supply, and will help to bring the analysis of this chapter to life.



SOURCE: © Kim Kulish/Corbis

THE INVISIBLE HAND

The **invisible hand** is a phrase used by Adam Smith to describe how, by pursuing their own self-interests, people in a market system are "led by an invisible hand" to promote the well-being of the community.

Adam Smith, the father of modern economic analysis, greatly admired the price system. He marveled at its accomplishments—both as an efficient producer of goods and as a guarantor that consumers' preferences are obeyed. Although many people since Smith's time have shared his enthusiasm for the concept of the **invisible hand**, many have not. Smith's contemporaries in the American colonies, for example, were often unhappy with the prices produced by free markets and thought they could do better by legislative decree. Such attempts failed, as explained in the accompanying box, "Price Controls at Valley Forge." In countless other instances, the public was outraged by the prices charged on the open market, particularly in the case of housing rents, interest rates, and insurance rates.

Attempts to control interest rates (which are the price of borrowing money) go back hundreds of years before the birth of Christ, at least to the code of laws compiled under the Babylonian king Hammurabi in about 1800 B.C. Our historical legacy also includes a rather long list of price ceilings on foods and other products imposed in the reign of Diocletian, emperor of the declining Roman Empire. More recently, Americans have been offered the "protection" of a variety of price controls. Laws have placed ceilings on some prices (such as rents) to protect buyers, whereas legislation has placed floors under other prices (such as farm products) to protect sellers. Yet, somehow, everything such regulation touches seems to end up in even greater disarray than it was before. Despite rent controls, rents in New York City have soared. Despite laws against "scalping," tickets for popular shows and sports events sell at tremendous premiums—tickets to the Super Bowl, for example, often fetch thousands of dollars on the "gray" market. To understand what goes wrong when we tamper with markets, we must first learn how they operate unfettered. This chapter takes a first step in that direction by studying the machinery of supply and demand. Then, at the end of the chapter, we return to the issue of price controls.

Every market has both buyers and sellers. We begin our analysis on the consumers' side of the market.

Price Controls at Valley Forge

George Washington, the history books tell us, was beset by many enemies during the winter of 1777–1778, including the British, their Hessian mercenaries, and the merciless winter weather. But he had another enemy that the history books ignore—an enemy that meant well but almost destroyed his army at Valley Forge. As the following excerpt explains, that enemy was the Pennsylvania legislature:

In Pennsylvania, where the main force of Washington's army was quartered . . . the legislature . . . decided to try a period of price control limited to those commodities needed for use by the army. . . . The result might have been anticipated by those with some knowledge of the trials and tribulations of other states. The prices of uncontrolled goods, mostly imported, rose to record heights. Most farmers kept back their produce, refusing to sell at what they regarded as an unfair price. Some who had large families to take care of even secretly sold their food to the British who paid in gold.

After the disastrous winter at Valley Forge when Washington's army nearly starved to death (thanks largely to these well-intentioned but misdirected laws), the ill-fated experiment in price controls was finally ended. The Continental Congress on June 4, 1778, adopted the following resolution:

"Whereas . . . it hath been found by experience that limitations upon the prices of commodities are not only ineffectual



SOURCE: Engraving: "Men Gathering Wood at Valley Forge," Metropolitan Museum of Art, bequest of Charles Allen Munn, 1924 [24.90.1828], All Rights Reserved, The Metropolitan Museum of Art.

for the purposes proposed, but likewise productive of very evil consequences . . . resolved, that it be recommended to the several states to repeal or suspend all laws or resolutions within the said states respectively limiting, regulating or restraining the Price of any Article, Manufacture or Commodity."

SOURCE: Robert L. Schuettinger and Eamonn F. Butler, *Forty Centuries of Wage and Price Controls* (Washington, D.C.: Heritage Foundation, 1979), p. 41. Reprinted by permission.

DEMAND AND QUANTITY DEMANDED

People commonly think of consumer demands as fixed amounts. For example, when product designers propose a new computer model, management asks: "What is its market potential?" That is, just how many are likely to be sold? Similarly, government bureaus conduct studies to determine how many engineers or doctors the United States will require (demand) in subsequent years.

Economists respond that such questions are not well posed—that there is no single answer to such a question. Rather, they say, the "market potential" for computers or the number of engineers that will be "required" depends on a great number of influences, including the price charged for each.

The quantity demanded of any product normally depends on its price. Quantity demanded also depends on a number of other determinants, including population size, consumer incomes, tastes, and the prices of other products.

Because prices play a central role in a market economy, we begin our study of demand by focusing on how quantity demanded depends on price. A little later, we will bring the other determinants of quantity demanded back into the picture. For now, we will consider all influences other than price to be fixed. This assumption, often expressed as "other things being equal," is used in much of economic analysis. As an example of the relationship between price and demand, let's think about the quantity of milk demanded. If the price of milk is very high, its "market potential" may be very small. People will find ways to get along with less milk, perhaps by switching to fruit juice or soda. If the price of milk declines, people will tend to drink more milk. They may give their children larger portions or switch away from juices and sodas. Thus:

There is no one demand figure for milk, or for computers, or for engineers. Rather, there is a different quantity demanded at each possible price, all other influences being held constant.

The **quantity demanded** is the number of units of a good that consumers are willing and can afford to buy over a specified period of time.

■ The Demand Schedule

A **demand schedule** is a table showing how the quantity demanded of some product during a specified period of time changes as the price of that product changes, holding all other determinants of quantity demanded constant.

A **demand curve** is a graphical depiction of a demand schedule. It shows how the quantity demanded of some product will change as the price of that product changes during a specified period of time, holding all other determinants of quantity demanded constant.

Table 1 shows how such information for milk can be recorded in a **demand schedule**. It indicates how much milk consumers in a particular area are willing and able to buy at different possible prices during a specified period of time, other things held equal. Specifically, the table shows the quantity of milk that will be demanded in a year at each possible price ranging from \$1.50 to \$0.90 per quart. At a relatively low price, such as \$1 per quart, customers wish to purchase 70 billion quarts per year. But if the price were to rise to, say, \$1.40 per quart, quantity demanded would fall to 50 billion quarts.

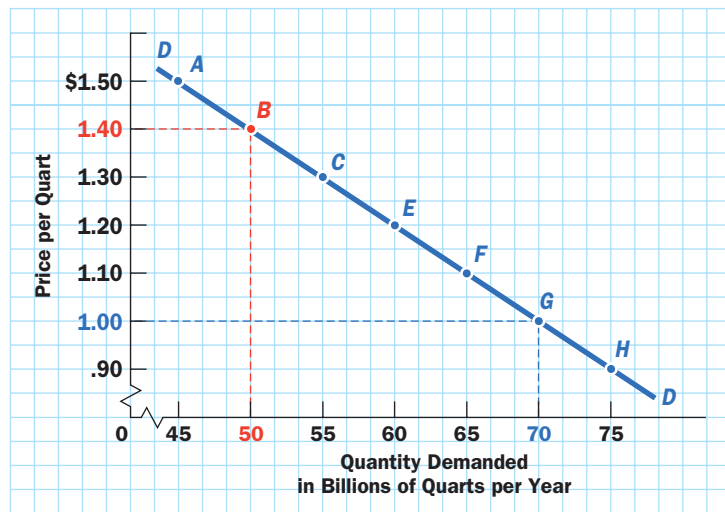
Common sense tells us why this happens.² First, as prices rise, some customers will reduce the quantity of milk they consume. Second, higher prices will induce some customers to drop out of the market entirely—for example, by switching to soda or juice. On both counts, quantity demanded will decline as the price rises.

As the price of an item rises, the quantity demanded normally falls. As the price falls, the quantity demanded normally rises, all other things held constant.

Price per Quart	Quantity Demanded	Label in Figure 1
\$1.50	45	A
1.40	50	B
1.30	55	C
1.20	60	E
1.10	65	F
1.00	70	G
0.90	75	H

Note: Quantity is in billions of quarts per year.

FIGURE 1
Demand Curve for Milk



■ The Demand Curve

The information contained in Table 1 can be summarized in a graph like Figure 1, which is called a **demand curve**. Each point in the graph corresponds to a line in the table. This curve shows the relationship between price and quantity demanded. For example, it tells us that to sell 70 billion quarts per year, the price must be \$1.00. This relationship is shown at point G in Figure 1. If the price were \$1.40, however, consumers would demand only 50 billion quarts (point B). Because the quantity demanded declines as the price increases, the demand curve has a negative slope.³

Notice the last phrase in the definitions of the demand schedule and the demand curve: “holding all other determinants of quantity demanded constant.” What are some of these “other things,” and how do they affect the demand curve?

■ Shifts of the Demand Curve

The quantity of milk demanded is subject to a variety of influences other than the price of milk. Changes in population size and characteristics, consumer incomes and tastes, and the prices of alternative beverages such as soda and orange juice presumably change the quantity of milk demanded, even if the price of milk does not change.

Because the demand curve for milk depicts only the relationship between the quantity of milk demanded and the price of milk, holding all other factors constant, a change in milk price moves the market for milk from one point on the demand curve

² This common-sense answer is examined more fully in later chapters.

³ If you need to review the concept of slope, refer back to the appendix to Chapter 1

to another point on the same curve. However, a change in any of these other influences on demand causes a **shift of the entire demand curve**. More generally:

A change in the price of a good produces a movement *along* a fixed demand curve. By contrast, a change in any other variable that influences quantity demanded produces a shift of the *entire* demand curve.

If consumers want to buy more milk at every given price than they wanted previously, the demand curve shifts to the right (or outward). If they desire less at every given price, the demand curve shifts to the left (or inward toward the origin).

Figure 2 shows this distinction graphically. If the price of milk falls from \$1.30 to \$1.10 per quart, and quantity demanded rises accordingly, we move along demand curve D_0D_0 from point C to point F , as shown by the red arrow. If, on the other hand, consumers suddenly decide that they like milk better than they did formerly, or if more children are born who need more milk, the entire demand curve shifts outward from D_0D_0 to D_1D_1 , as indicated by the blue arrows, meaning that at *any* given price consumers are now willing to buy more milk than before. To make this general idea more concrete, and to show some of its many applications, let us consider some specific examples of those “other things” that can shift demand curves.

Consumer Incomes If average incomes rise, consumers will purchase more of most goods, including milk, even if the prices of those goods remain the same. That is, increases in income normally shift demand curves outward to the right, as depicted in Figure 3(a), where the demand curve shifts outward from D_0D_0 to D_1D_1 , establishing a new price and output quantity.

Population Population growth affects quantity demanded in more or less the same way as increases in average incomes. For instance, a larger population will presumably want to consume more milk, even if the price of milk and average incomes do not change, thus shifting the entire demand curve to the right, as in Figure 3(a). The equilibrium price and quantity both rise.

Increases in particular population segments can also elicit shifts in demand—for example, the United States experienced a miniature population boom between the late 1970s and mid-1990s. This group (which is dubbed Generation Y and includes most users of this book) has sparked higher demand for such items as cell phones and video games.

In Figure 3(b), we see that a decrease in population should shift the demand curve for milk to the left from D_0D_0 to D_2D_2 .

Consumer Preferences If the dairy industry mounts a successful advertising campaign extolling the benefits of drinking milk, families may decide to buy more at any given price. If so, the entire demand curve for milk would shift to the right, as in Figure 3(a). Alternatively, a medical report on the dangers of kidney stones may persuade consumers to drink less milk, thereby shifting the demand curve to the left, as in Figure 3(b). Again, these are general phenomena:

If consumer preferences shift in favor of a particular item, its demand curve will shift outward to the right, as in Figure 3(a).

A **shift in a demand curve** occurs when any relevant variable other than price changes. If consumers want to buy *more* at any and all given prices than they wanted previously, the demand curve shifts to the right (or outward). If they desire *less* at any given price, the demand curve shifts to the left (or inward).

FIGURE 2

Movements along versus Shifts of a Demand Curve

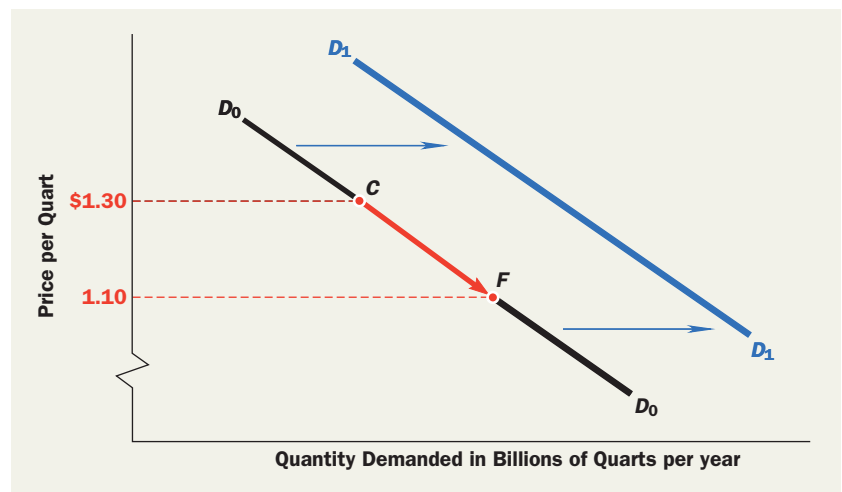
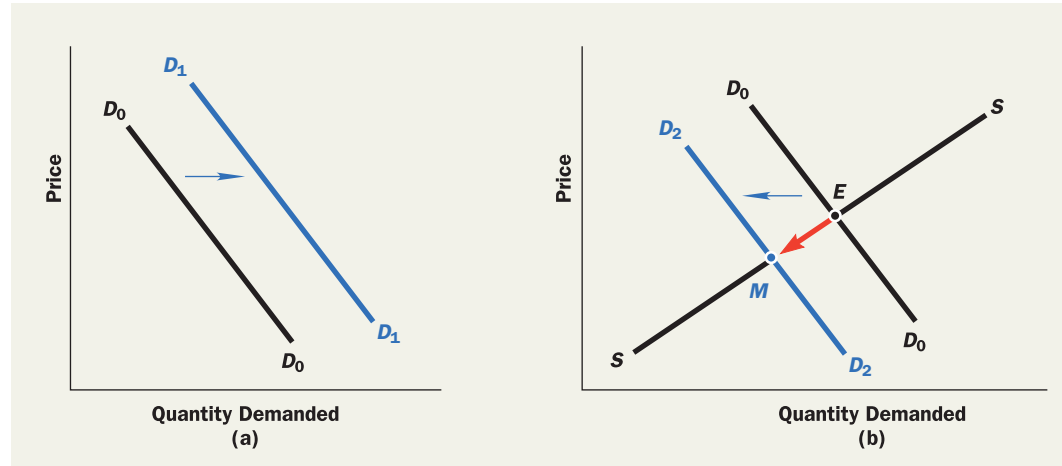


FIGURE 3
Shifts of the Demand Curve



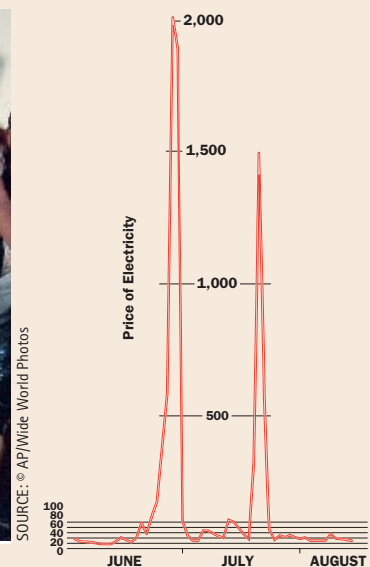
An example is the ever-shifting “rage” in children’s toys—be it Yu-Gi-Oh! cards, electronic “Elmo” dolls, or the latest video games. These items become the object of desperate hunts as parents snap them up for their offspring, and stores are unable to keep up with the demand.

Prices and Availability of Related Goods Because soda, orange juice, and coffee are popular drinks that compete with milk, a change in the price of any of these other beverages can be expected to shift the demand curve for milk. If any of these alterna-

Volatility in Electricity Prices

The following newspaper story excerpt shows the dramatic effect on prices that can sometimes result from a shift in a demand curve. The source of the accompanying graph is Enron Corporation, the former energy trading and commodities company that has been labeled one of the worst offenders in the corporate scandals that came to light in the last few years. Although Enron was found to have distorted many relevant facts, what is reported in this excerpt from the *New York Times* is generally true. What is left out, however, is how Enron is said to have manipulated the market and distorted market prices to favor people in top management at the expense of consumers and company employees. Such a scenario demonstrates how a powerful firm can distort the supply-demand mechanism and manipulate its results.

“Because no one can stockpile electricity . . . prices have proved to be extremely volatile at times of high demand like a recent summer’s heat waves. Here is the *Cinergy-Power Markets Week* daily index, in dollars per megawatt hour. When heat waves blistered much of the country in June and July of 1998, utility customers in cities like Dallas ran fans and air conditioners nonstop, and power demand soared. So the price of electricity exploded, as the graph demonstrates.”



NOTE: Quantity is in billions of quarts per year.

SOURCES: *New York Times*, Business Section, August 23, 1998, p. 4 (text). Scatter Graph showing power prices from July to August from “A 20,000% Bounce: Now That’s Volatility” by A.R. Myerson, *The New York Times*, Business Section, August 8, 1998, p. 4. Copyright © 1998 by The New York Times. Reprinted by permission; Enron Corporation (graph).

tive drinks becomes cheaper, some consumers will switch away from milk. Thus, the demand curve for milk will shift to the left, as in Figure 3(b). Other price changes may shift the demand curve for milk in the opposite direction. For example, suppose that cookies, which are often consumed with milk, become less expensive. This may induce some consumers to drink more milk and thus shift the demand curve for milk to the right, as in Figure 3(a). In general:

Increases in the prices of goods that are substitutes for the good in question (as soda is for milk) move the demand curve to the right. Increases in the prices of goods that are normally used together with the good in question (such as cookies and milk) shift the demand curve to the left.

This is just what happened when a frost wiped out almost half of Brazil's coffee bean harvest in 1995. The three largest U.S. coffee producers raised their prices by 45 percent, and, as a result, the demand curve for alternative beverages such as tea shifted to the right. Then in 1998, coffee prices dropped about 34 percent, which in turn caused the demand curve for tea to shift toward the left (or toward the origin).

Although the preceding list does not exhaust the possible influences on quantity demanded, we have said enough to suggest the principles followed by demand and shifts of demand. Let's turn now to the supply side of the market.

SUPPLY AND QUANTITY SUPPLIED

Like quantity demanded, the quantity of milk that is supplied by business firms such as dairy farms is not a fixed number; it also depends on many things. Obviously, we expect more milk to be supplied if there are more dairy farms or more cows per farm. Cows may give less milk if bad weather deprives them of their feed. As before, however, let's turn our attention first to the relationship between the price and quantity of milk supplied.

Economists generally suppose that a higher price calls forth a greater **quantity supplied**. Why? Remember our analysis of the principle of increasing cost in Chapter 3 (page 40). According to that principle, as more of any farmer's (or the nation's) resources are devoted to milk production, the opportunity cost of obtaining another quart of milk increases. Farmers will therefore find it profitable to increase milk production only if they can sell the milk at a higher price—high enough to cover the additional costs incurred to expand production.

In other words, it normally will take higher prices to persuade farmers to raise milk production. This idea is quite general and applies to the supply of most goods and services.⁴ As long as suppliers want to make profits and the principle of increasing costs holds:

As the price of any commodity rises, the quantity supplied normally rises. As the price falls, the quantity supplied normally falls.

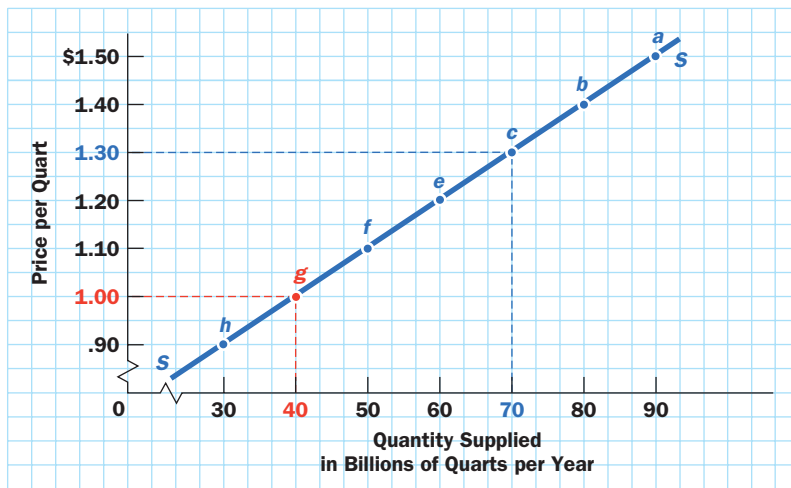
The Supply Schedule and the Supply Curve

Table 2 shows the relationship between the price of milk and its quantity supplied. Tables such as this one are called **supply schedules**; they show how much sellers are willing to provide during a specified period at alternative possible prices. This particular supply schedule tells us that a low price like \$1.00 per quart will induce suppliers to provide only 40 billion quarts, whereas a higher price like \$1.30 will induce them to provide much more—70 billion quarts.

The **quantity supplied** is the number of units that sellers want to sell over a specified period of time.

A **supply schedule** is a table showing how the quantity supplied of some product changes as the price of that product changes during a specified period of time, holding all other determinants of quantity supplied constant.

⁴ This analysis is carried out in much greater detail in later chapters.

FIGURE 4 Supply Curve for Milk

A **supply curve** is a graphical depiction of a supply schedule. It shows how the quantity supplied of some product will change as the price of that product changes during a specified period of time, holding all other determinants of quantity supplied constant.

As you might have guessed, when such information is plotted on a graph, it is called a **supply curve**. Figure 4 is the supply curve corresponding to the supply schedule in Table 2, showing the relationship between the price of milk and the quantity supplied. It slopes upward—it has a positive slope—because quantity supplied is higher when price is higher. Notice again the same phrase in the definition: “holding all other determinants of quantity supplied constant.” What are these “other determinants”?

■ Shifts of the Supply Curve

Like quantity demanded, the quantity supplied in a market typically responds to many influences other than price. The weather, the cost of feed, the number and size of dairy farms, and a variety of other factors all influence how much milk will be brought to market. Because the supply curve depicts only the relationship between the price of milk and the quantity of milk supplied, holding all other influences constant, a change in any of these other determinants of quantity supplied will cause the entire supply curve to shift. That is:

A change in the price of the good causes a movement *along* a fixed supply curve. Price is not the only influence on quantity supplied, however. If any of these other influences change, the *entire* supply curve shifts.

Figure 5 depicts this distinction graphically. A rise in price from \$1.10 to \$1.30 will raise quantity supplied by moving along supply curve S_0S_0 from point f to point c . Any rise in quantity supplied attributable to an influence other than price, however, will shift the *entire* supply curve outward to the right from S_0S_0 to S_1S_1 , as shown by the blue arrows. Let us consider what some of these other influences are and how they shift the supply curve.

Size of the Industry We begin with the most obvious influence. If more farmers enter the milk industry, the quantity supplied at any given price will increase. For example, if each farm provides 600,000 quarts of milk per year at a price of \$1.10 per quart, then 100,000 farmers would provide 60 billion quarts, but 130,000 farmers would provide 78 billion. Thus, when more farms are in the industry, the quantity of milk supplied will be greater at any given price—and hence the supply curve will move farther to the right.

TABLE 2**Supply Schedule for Milk**

Price per Quart	Quantity Supplied	Label in Figure 4
\$1.50	90	<i>a</i>
1.40	80	<i>b</i>
1.30	70	<i>c</i>
1.20	60	<i>e</i>
1.10	50	<i>f</i>
1.00	40	<i>g</i>
0.90	30	<i>h</i>

Note: Quantity is in billions of quarts per year.

Figure 6(a) illustrates the effect of an expansion of the industry from 100,000 farms to 130,000 farms—a rightward shift of the supply curve from S_0S_0 to S_1S_1 . Figure 6(b) illustrates the opposite case: a contraction of the industry from 100,000 farms to 62,500 farms. The supply curve shifts inward to the left from S_0S_0 to S_2S_2 . Even if no farmers enter or leave the industry, results like those depicted in Figure 6 can be produced by expansion or contraction of the existing farms.

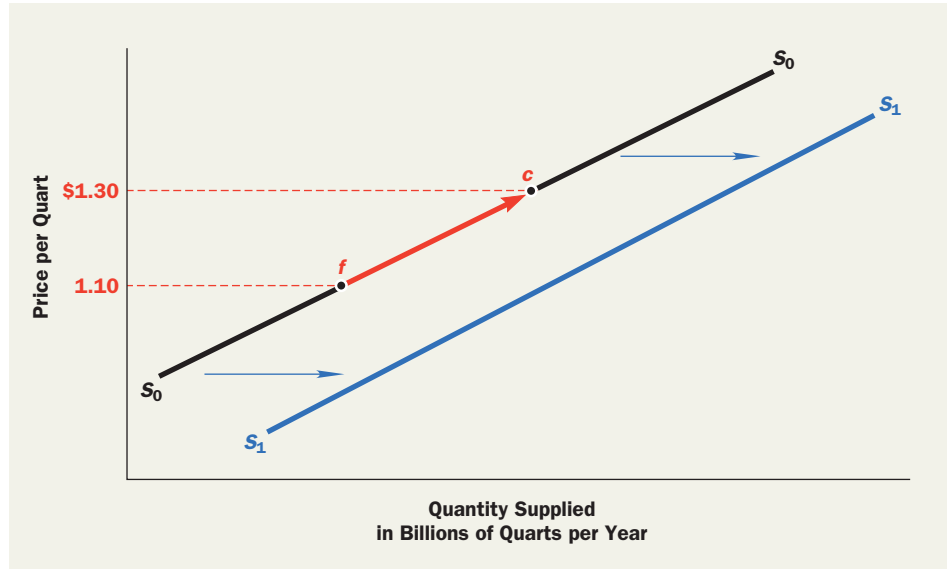


FIGURE 5
Movements along versus Shifts of a Supply Curve

Technological Progress Another influence that shifts supply curves is technological change. Suppose some enterprising farmer invents a new milking machine that uses much less electricity. Thereafter, at any given price, farms will be able to produce more milk; that is, the supply curve will shift outward to the right, as in Figure 6(a). This example, again, illustrates a general influence that applies to most industries:

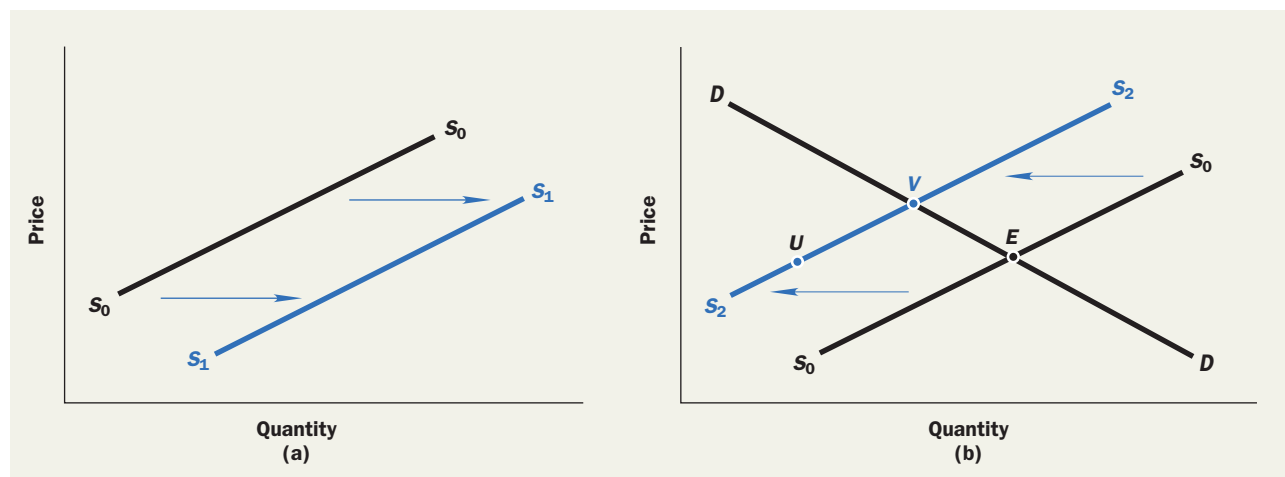
Technological progress that reduces costs will shift the supply curve outward to the right.

Automakers, for example, have been able to reduce production costs since industrial technology invented robots that can be programmed to work on several different car models. This technological advance has shifted the supply curve outward.

Prices of Inputs Changes in input prices also shift supply curves. Suppose a drought raises the price of animal feed. Farmers will have to pay more to keep their cows alive and healthy and consequently will no longer be able to provide the same quantity of milk at each possible price. This example illustrates that:

Increases in the prices of inputs that suppliers must buy will shift the supply curve inward to the left.

FIGURE 6 Shifts of the Supply Curve



Prices of Related Outputs Dairy farms sell products other than milk. If cheese prices rise sharply, farmers may decide to use some raw milk to make cheese, thereby reducing the quantity of milk supplied. On a supply-demand diagram, the supply curve would then shift inward, as in Figure 6(b).

Similar phenomena occur in other industries, and sometimes the effect goes the other way. For example, suppose that the price of beef goes up, which increases the quantity of meat supplied. That, in turn, will raise the number of cowhides supplied even if the price of leather does not change. Thus, a rise in the price of beef will lead to a rightward shift in the supply curve of leather. In general:

A change in the price of one good produced by a multiproduct industry may be expected to shift the supply curves of other goods produced by that industry.

SUPPLY AND DEMAND EQUILIBRIUM

To analyze how the free market determines price, we must compare the desires of consumers (demand) with the desires of producers (supply) to see whether the two plans are consistent. Table 3 and Figure 7 help us do this.

A **supply-demand diagram** graphs the supply and demand curves together. It also determines the equilibrium price and quantity.

Table 3 brings together the demand schedule from Table 1 and the supply schedule from Table 2. Similarly, Figure 7 puts the demand curve from Figure 1 and the supply curve from Figure 4 on a single graph. Such graphs are called **supply-demand diagrams**, and you will encounter many of them in this book. Notice that, for reasons already discussed, the demand curve has a negative slope and the supply curve has a positive slope. That is generally true of supply-demand diagrams.

In a free market, price and quantity are determined by the intersection of the supply and demand curves. At only one point in Figure 7, point *E*, do the supply curve and the demand curve intersect. At the price corresponding to point *E*, which is \$1.20 per quart, the quantity supplied and the quantity demanded are both 60 billion quarts per year. This means that at a price of \$1.20 per quart, consumers are willing to buy exactly what producers are willing to sell.

At a lower price, such as \$1.00 per quart, only 40 billion quarts of milk will be supplied (point *g*) whereas 70 billion quarts will be demanded (point *G*). Thus, quantity

FIGURE 7

Supply-Demand Equilibrium

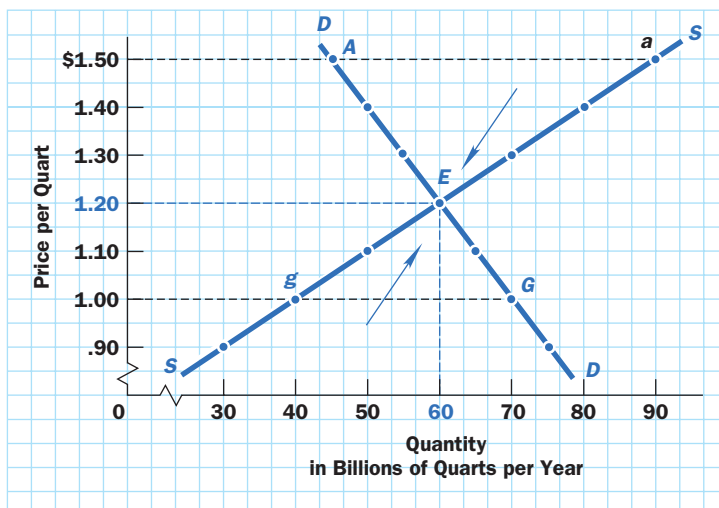


TABLE 3

Determination of the Equilibrium Price and Quantity of Milk

Price per Quart	Quantity Demanded	Quantity Supplied	Surplus or Shortage?	Price Direction
\$1.50	45	90	Surplus	Fall
1.40	50	80	Surplus	Fall
1.30	55	70	Surplus	Fall
1.20	60	60	Neither	Unchanged
1.10	65	50	Shortage	Rise
1.00	70	40	Shortage	Rise
0.90	75	30	Shortage	Rise

demanded will exceed quantity supplied. There will be a **shortage** equal to 70 minus 40, or 30 billion quarts. Price will thus be driven up by unsatisfied demand. Alternatively, at a higher price, such as \$1.50 per quart, quantity supplied will be 90 billion quarts (point *a*) and quantity demanded will be only 45 billion (point *A*). Quantity supplied will exceed quantity demanded—creating a **surplus** equal to 90 minus 45, or 45 billion quarts.

Because \$1.20 is the price at which quantity supplied and quantity demanded are equal, we say that \$1.20 per quart is the equilibrium price (or the “market clearing” price) in this market. Similarly, 60 billion quarts per year is the equilibrium quantity of milk. The term **equilibrium** merits a little explanation, because it arises so frequently in economic analysis.

An equilibrium is a situation in which there are no inherent forces that produce change. Think, for example, of a pendulum resting at its center point. If no outside force (such as a person’s hand) comes to push it, the pendulum will remain exactly where it is; it is therefore in equilibrium.

If you give the pendulum a shove, however, its equilibrium will be disturbed and it will start to move. When it reaches the top of its arc, the pendulum will, for an instant, be at rest again. This point is not an equilibrium position, for the force of gravity will pull the pendulum downward. Thereafter, gravity and friction will govern its motion from side to side. Eventually, the pendulum will return to its original position. The fact that the pendulum tends to return to its original position is described by saying that this position is a *stable* equilibrium. That position is also the only equilibrium position of the pendulum. At any other point, inherent forces will cause the pendulum to move.

The concept of equilibrium in economics is similar and can be illustrated by our supply-and-demand example. Why is no price other than \$1.20 an equilibrium price in Table 3 or Figure 7? What forces will change any other price?

Consider first a low price such as \$1.00, at which quantity demanded (70 billion quarts) exceeds quantity supplied (40 billion quarts). If the price were this low, many frustrated customers would be unable to purchase the quantities they desired. In their scramble for the available supply of milk, some would offer to pay more. As customers sought to outbid one another, the market price would be forced up. Thus, a price below the equilibrium price cannot persist in a free market because a shortage sets in motion powerful economic forces that push the price upward.

Similar forces operate if the market price exceeds the equilibrium price. If, for example, the price somehow reach \$1.50, Table 3 tells us that quantity supplied (90 billion quarts) would far exceed the quantity demanded (45 billion quarts). Producers would be unable to sell their desired quantities of milk at the prevailing price, and some would undercut their competitors by reducing price. Such competitive price cutting would continue as long as the surplus remained—that is, as long as quantity supplied exceeded quantity demanded. Thus, a price above the equilibrium price cannot persist indefinitely.

We are left with a clear conclusion. The price of \$1.20 per quart and the quantity of 60 billion quarts per year constitute the only price-quantity combination that does not sow the seeds of its own destruction. It is thus the only equilibrium for this market. Any lower price must rise, and any higher price must fall. It is as if natural economic forces place a magnet at point *E* that attracts the market, just as gravity attracts a pendulum.

The pendulum analogy is worth pursuing further. Most pendulums are more frequently in motion than at rest. However, unless they are repeatedly buffeted by outside forces (which, of course, is exactly what happens to economic equilibria in reality), pendulums gradually return to their resting points. The same is true of price and quantity in a free market. They are moved about by shifts in the supply and demand curves that we have already described. As a consequence, markets are not always in equilibrium. But, if nothing interferes with them, experience shows that they normally move toward equilibrium.

A **shortage** is an excess of quantity demanded over quantity supplied. When there is a shortage, buyers cannot purchase the quantities they desire at the current price.

A **surplus** is an excess of quantity supplied over quantity demanded. When there is a surplus, sellers cannot sell the quantities they desire to supply at the current price.

An **equilibrium** is a situation in which there are no inherent forces that produce change. Changes away from an equilibrium position will occur only as a result of “outside events” that disturb the status quo.

The **law of supply and demand** states that in a free market the forces of supply and demand generally push the price toward the level at which quantity supplied and quantity demanded are equal.

■ The Law of Supply and Demand

In a free market, the forces of supply and demand generally push the price toward its equilibrium level, the price at which quantity supplied and quantity demanded are equal. Like most economic “laws,” some markets will occasionally disobey the law of supply and demand. Markets sometimes display shortages or surpluses for long periods of time. Prices sometimes fail to move toward equilibrium. But the “law” is a fair generalization that is right far more often than it is wrong.

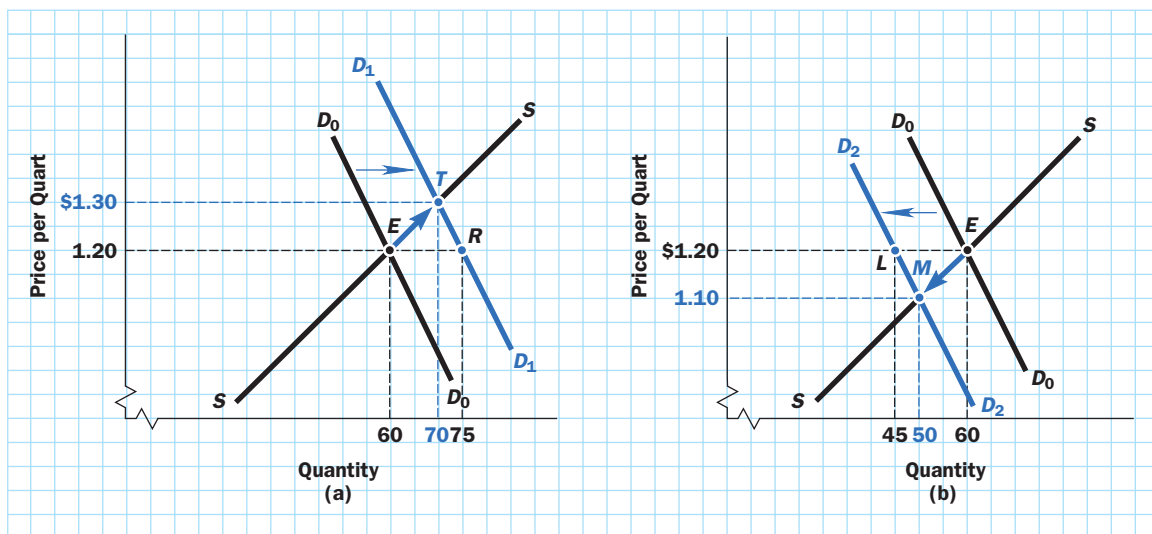
■ EFFECTS OF DEMAND SHIFTS ON SUPPLY-DEMAND EQUILIBRIUM

Figure 3 showed how developments other than changes in price—such as increases in consumer income—can shift the demand curve. We saw that a rise in income, for example, will shift the demand curve to the right, meaning that at any given price, consumers—with their increased purchasing power—will buy more of the good than before. This, in turn, will move the equilibrium point, changing both market price and quantity sold.

This market adjustment is shown in Figure 8(a). It adds a supply curve to Figure 3(a) so that we can see what happens to the supply-demand equilibrium. In the example in the graph, the quantity demanded at the old equilibrium price of \$1.20 increases from 60 billion quarts per year (point *E* on the demand curve D_0D_0) to 75 billion quarts per year (point *R* on the demand curve D_1D_1). We know that \$1.20 is no longer the equilibrium price, because at this price quantity demanded (75 billion quarts) exceeds quantity supplied (60 billion quarts). To restore equilibrium, the price must rise. The new equilibrium occurs at point *T*, where the price is \$1.30 per quart and both quantities demanded and supplied are 70 billion quarts per year. This example illustrates a general result, which is true when the supply curve slopes upward:

Any influence that makes the demand curve shift outward to the right, and does not affect the supply curve, will raise the equilibrium price and the equilibrium quantity.⁵

FIGURE 8 The Effects of Shifts of the Demand Curve



Note: Quantity is in billions of quarts per year.

⁵ For example, when incomes rise rapidly, in many developing countries the demand curves for a variety of consumer goods shift rapidly outward to the right. In Japan, for example, the demand for used Levi's jeans and Nike running shoes from the United States skyrocketed in the early 1990s as status-conscious Japanese consumers searched for outlets for their then-rising incomes.

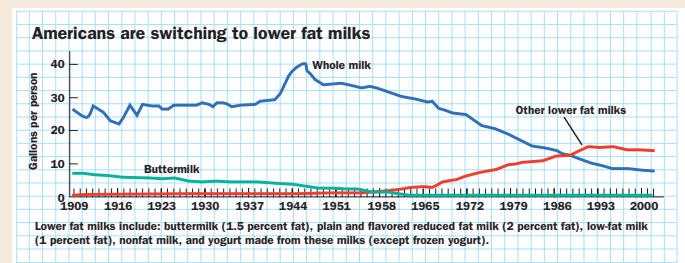
The Ups and Downs of Milk Consumption

The following excerpt from a U.S. Department of Agriculture publication discusses some of the things that have affected the consumption of milk in the last century.

"In 1909, Americans consumed a total of 34 gallons of fluid milk per person—27 gallons of whole milk and 7 gallons of milks lower in fat than whole milk, mostly buttermilk....Fluid milk consumption shot up from 34 gallons per person in 1941 to a peak of 45 gallons per person in 1945. War production lifted Americans' incomes but curbed civilian production and the goods consumers could buy. Many food items were rationed, including meats, butter and sugar. Milk was not rationed, and consumption soared. Since 1945, however, milk consumption has fallen steadily, reaching a record low of just under 23 gallons per person in 2001 (the latest year for which data are available). Steep declines in consumption of whole milk and buttermilk far outpaced an increase in other lower fat milks. By 2001, Americans were consuming less than 8 gallons per person of whole milk, compared with nearly 41 gallons in 1945 and 25 gallons in 1970. In contrast, per capita consumption of total lower fat milks was 15 gallons in 2001, up from 4 gallons in 1945 and 6 gallons in 1970. These changes are consistent with increased

public concern about cholesterol, saturated fat, and calories. However, decline in per capita consumption of fluid milk also may be attributed to competition from other beverages, especially carbonated soft drinks and bottled water, a smaller percentage of children and adolescents in the U.S., and a more ethnically diverse population whose diet does not normally include milk."

SOURCE: Judy Putnam and Jane Allhouse, "Trends in U.S. Per Capita Consumption of Dairy Products, 1909 to 2001," *Amber Waves: The Economics of Food, Farming, Natural Resources and Rural America*, June 2003, U.S. Department of Agriculture, available at <http://www.usda.gov>.



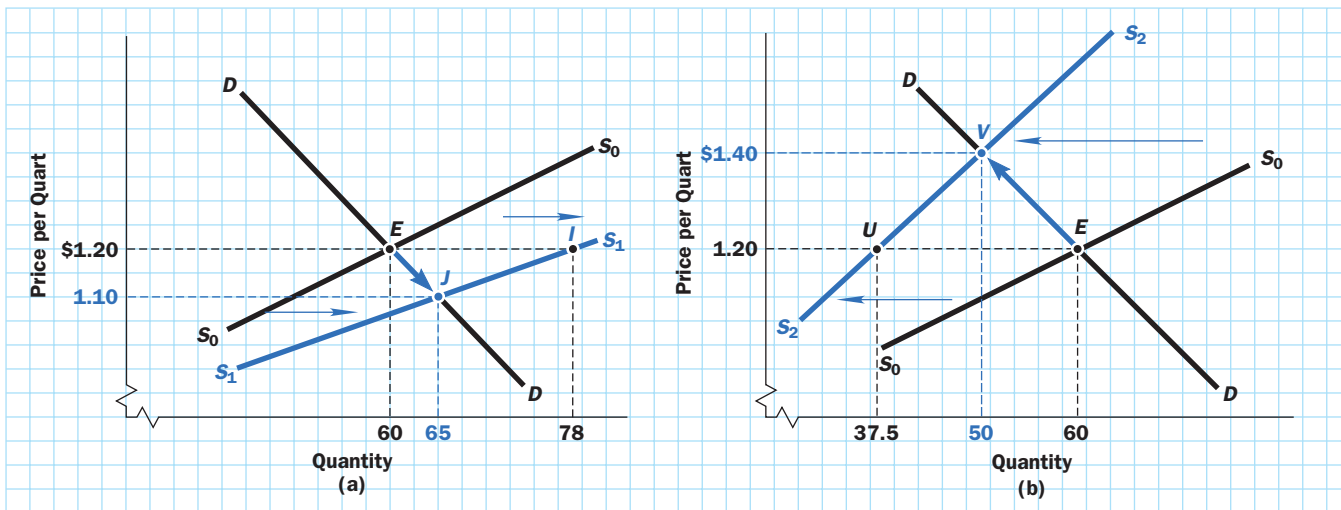
Everything works in reverse if consumer incomes fall. Figure 8(b) depicts a leftward (inward) shift of the demand curve that results from a decline in consumer incomes. For example, the quantity demanded at the previous equilibrium price (\$1.20) falls from 60 billion quarts (point *E*) to 45 billion quarts (point *L* on the demand curve D_2D_2). The initial price is now too high and must fall. The new equilibrium will eventually be established at point *M*, where the price is \$1.10 and both quantity demanded and quantity supplied are 50 billion quarts. In general:

Any influence that shifts the demand curve inward to the left, and that does not affect the supply curve, will lower both the equilibrium price and the equilibrium quantity.

SUPPLY SHIFTS AND SUPPLY-DEMAND EQUILIBRIUM

A story precisely analogous to that of the effects of a demand shift on equilibrium price and quantity applies to supply shifts. Figure 6 described the effects on the supply curve of milk if the number of farms increases. Figure 9(a) now adds a demand curve to the supply curves of Figure 6 so that we can see the supply-demand equilibrium. Notice that at the initial price of \$1.20, the quantity supplied after the shift is 78 billion quarts (point *I* on the supply curve S_1S_1), which is 30 percent more than the original quantity demanded of 60 billion quarts (point *E* on the supply curve S_0S_0). We can see from the graph that the price of \$1.20 is too high to be the equilibrium price; the price must fall. The new equilibrium point is *J*, where the price is \$1.10 per quart and the quantity is 65 billion quarts per year. In general:

Any change that shifts the supply curve outward to the right, and does not affect the demand curve, will lower the equilibrium price and raise the equilibrium quantity.

FIGURE 9 Effects of Shifts of the Supply Curve

This must always be true if the industry's demand curve has a negative slope, because the greater quantity supplied can be sold only if the price is decreased so as to induce customers to buy more.⁶ The cellular phone industry is a case in point. As more providers have entered the industry, the cost of cellular service has plummeted. Some cellular carriers have even given away telephones as sign-up bonuses.

Figure 9(b) illustrates the opposite case: a contraction of the industry. The supply curve shifts inward to the left and equilibrium moves from point E to point V , where the price is \$1.40 and quantity is 50 billion quarts per year. In general:

Any influence that shifts the supply curve to the left, and does not affect the demand curve, will raise the equilibrium price and reduce the equilibrium quantity.

Many outside forces can disturb equilibrium in a market by shifting the demand curve or the supply curve, either temporarily or permanently. In 1998, for example, gasoline prices dropped because recession in Asia reduced demand, and a reduction in use of petroleum resulted from a mild winter. In the summer of 1998, severely hot weather and lack of rain damaged the cotton crop in the United States. Often these outside influences change the equilibrium price and quantity by shifting either the supply curve or the demand curve. If you look again at Figures 8 and 9, you can see clearly that any event that causes either the demand curve or the supply curve to shift will also change the equilibrium price and quantity.



Those Leaping Oil Prices: PUZZLE RESOLVED

The disturbing recent behavior of the price of gasoline, and of the oil from which it is made, is attributable to large shifts in both demand and supply conditions. Americans are, for example, driving more and are buying gas-guzzling vehicles, and the resulting upward shift in the demand curve raises price. Instability in the Middle East and Russia have undermined supply, and that also raised prices. We have seen the results at the gas pumps. The following newspaper story describes some of the most sensational sorts of changes in supply conditions:

⁶ Graphically, whenever a positively sloped curve shifts to the right, its intersection point with a negatively sloping curve must always move lower. Just try drawing it yourself.

BAGHDAD, July 5, 2004—Oil prices rose Monday after attacks on Iraqi oil lines forced the country to reduce its exports by half. News of Russian giant Yukos Oil Co.'s expanding legal and financial troubles added to traders' anxiety.

Iraqi repair crews worked to fix one of two key southern crude oil pipelines, officials in the state-run South Oil Co. said. The disruption, about two weeks after exports were halted because of attacks on the two export lines, heightened concern among traders and analysts about the security of Iraq's oil flow.

The shutdown cut exports of crude oil from Basra to about 960,000 barrels a day, roughly half the postwar levels there. . . . In London, contracts of North Sea Brent crude for August delivery were trading at \$36.30 per barrel, up 38 cents on the International Petroleum Exchange, before closing at \$35.92. . . .

The current Iraqi disruption began Saturday when the line was breached, reportedly by smugglers, an oil company official said on condition of anonymity. On Sunday, saboteurs blasted another strategic line running from the north to the south, but South Oil officials said that line had not been used extensively for years, so exports would not be affected.

Also Monday, Russia's Yukos came a step closer to bankruptcy after a group of Western banks signaled they might call in a \$1 billion loan to the company. . . . Yukos has been ordered to pay a 99.4-billion-ruble (\$3.4 billion) back-taxes bill by Thursday. Its bank accounts were ordered frozen last week, and a freeze on its assets remains in place, giving the company no way to raise money. With a daily output of about 1.72 million barrels, or nearly one in every five that Russia extracts, Yukos is the country's largest oil producer.

Source: Tarek El-Tablawy, "Pipeline Sabotage in Iraq Helps Send Oil Prices Skyward," as appeared in *Washington Post*, July 5, 2004. Copyright 2005 Associated Press. All rights reserved. Distributed by Valeo IP. Reprinted by permission.

■ Application: Who Really Pays That Tax?

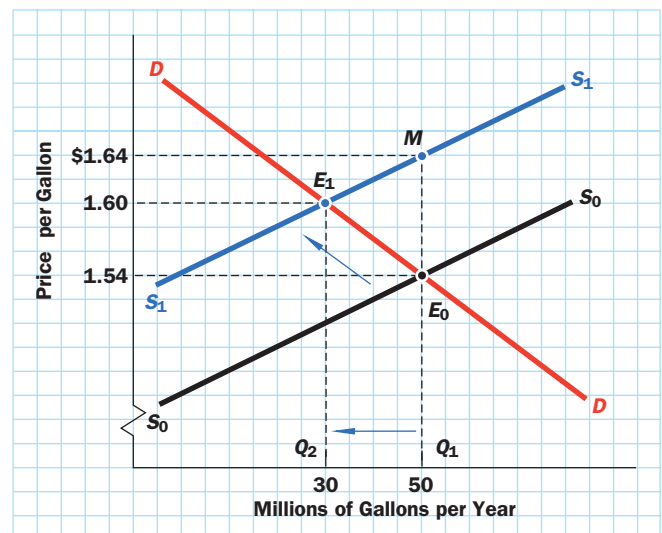
Supply and demand analysis offers insights that may not be readily apparent. Here is an example. Suppose your state legislature raises the gasoline tax by 10 cents per gallon. Service station operators will then have to collect 10 additional cents in taxes on every gallon they pump. They will consider this higher tax as an addition to their costs and will shift it to you and other consumers by raising the price of gas by 10 cents per gallon. Right? No, wrong—or rather, partly wrong.

The gas station owners would certainly *like* to shift the entire tax to buyers, but the market mechanism will allow them to shift only *part* of it—perhaps 6 cents per gallon. They will then be stuck with the remainder—4 cents in our example. Figure 10, which is just another supply-demand graph, shows why.

The demand curve is the red curve DD . The supply curve before the tax is the black curve S_0S_0 . Before the new tax, the equilibrium point is E_0 and the price is \$1.54. We can interpret the supply curve as telling us at what price sellers are willing to provide any given quantity. For example, they are willing to supply quantity $Q_1 = 50$ million gallons per year if the price is \$1.54 per gallon.

So what happens as a result of the new tax? Because they must now turn 10 cents per gallon over to the government, gas station owners will be willing to supply any given quantity only if they get 10 cents

FIGURE 10
Who Pays for a New Tax on Products?



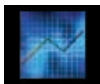
more per gallon than they did before. Therefore, to get them to supply quantity $Q_1 = 50$ million gallons, a price of \$1.54 per gallon will no longer suffice. Only a price of \$1.64 per gallon will now induce them to supply 50 million gallons. Thus, at quantity $Q_1 = 50$, the point on the supply curve will move up by 10 cents, from point E_0 to point M . Because firms will insist on the same 10-cent price increase for any other quantity they supply, the *entire* supply curve will shift up by the 10-cent tax—from the black curve S_0S_0 to the new blue supply curve S_1S_1 . And, as a result, the supply-demand equilibrium point will move from E_0 to E_1 and the price will increase from \$1.54 to \$1.60.

The supply curve shift may give the impression that gas station owners have succeeded in passing the entire 10-cent increase on to consumers—the distance from E_0 to M —but look again. The *equilibrium* price has only gone up from \$1.54 to \$1.60. That is, the price has risen by only 6 cents, not by the full 10-cent amount of the tax. The gas station will have to absorb the remaining 4 cents of the tax.

Now this really *looks* as though we have pulled a fast one on you—a magician's sleight of hand. After all, the supply curve has shifted upward by the full amount of the tax, and yet the resulting price increase has covered only part of the tax rise. However, a second look reveals that, like most apparent acts of magic, this one has a simple explanation. The explanation arises from the *demand* side of the supply-demand mechanism. The negative slope of the demand curve means that when prices rise, at least some consumers will reduce the quantity of gasoline they demand. That will force sellers to give up part of the price increase. In other words, firms must absorb the part of the tax—4 cents—that consumers are unwilling to pay. But note that the equilibrium quantity Q_1 has fallen from 50 million gallons to $Q_2 = 30$ million gallons—so both consumers and suppliers lose out in some sense.

This example is not an oddball case. Indeed, the result is almost always true. The cost of any increase in a tax on any commodity will usually be paid partly by the consumer and partly by the seller. This is so no matter whether the legislature says that it is imposing the tax on the sellers or on the buyers. Whichever way it is phrased, the economics are the same: The supply-demand mechanism ensures that the tax will be shared by both of the parties.

BATTLING THE INVISIBLE HAND: THE MARKET FIGHTS BACK



IDEAS FOR
BEYOND THE
FINAL EXAM

As we noted in our *Ideas for Beyond the Final Exam* in Chapter 1, lawmakers and rulers have often been dissatisfied with the outcomes of free markets. From Rome to Reno, and from biblical times to the space age, they have battled the invisible hand. Sometimes, rather than trying to adjust the workings of the market, governments have tried to raise or lower the prices of specific commodities by decree. In many such cases, the authorities felt that market prices were, in some sense, immorally low or immorally high. Penalties were therefore imposed on anyone offering the commodities in question at prices above or below those established by the authorities. Such legally imposed constraints on prices are called “price ceilings” and “price floors.” To see their result, we will focus on the use of price ceilings.

■ Restraining the Market Mechanism: Price Ceilings

The market has proven itself a formidable foe that strongly resists attempts to get around its decisions. In case after case where legal **price ceilings** are imposed, virtually the same series of consequences ensues:

1. *A persistent shortage develops because quantity demanded exceeds quantity supplied.* Queuing (people waiting in lines), direct rationing (with everyone getting a fixed allotment), or any of a variety of other devices, usually inefficient and unpleasant, must substitute for the distribution process provided by the price mechanism. Example: Rampant shortages in Eastern Europe and the former Soviet Union helped precipitate the revolts that ended communism.

A **price ceiling** is a maximum that the price charged for a commodity cannot legally exceed.

POLICY DEBATE

Economic Aspects of the War on Drugs

For years now, the U.S. government has engaged in a highly publicized “war on drugs.” Billions of dollars have been spent on trying to stop illegal drugs at the country’s borders. In some sense, interdiction has succeeded: Federal agents have seized literally tons of cocaine and other drugs. Yet these efforts have made barely a dent in the flow of drugs to America’s city streets. Simple economic reasoning explains why.

When drug interdiction works, it shifts the supply curve of drugs to the left, thereby driving up street prices. But that, in turn, raises the rewards for potential smugglers and attracts more criminals into the “industry,” which shifts the supply curve back to the right. The net result is that increased shipments of drugs to U.S. shores replace much of what the authorities confiscate. This is why many economists believe that any successful antidrug program must concentrate on reducing demand, which would lower the street price of drugs, not on reducing supply, which can only raise it.

Some people suggest that the government should go even further and legalize many drugs. Although this idea remains a highly controversial position that few are ready to endorse, the reasoning behind it is straightforward. A stunningly high fraction of all the violent crimes committed in America—especially robberies and murders—are drug-related. One major reason is

that street prices of drugs are so high that addicts must steal to get the money, and drug traffickers are all too willing to kill to protect their highly profitable “businesses.”

How would things differ if drugs were legal? Because South American farmers earn pennies for drugs that sell for hundreds of dollars on the streets of Los Angeles and New York, we may safely assume that legalized drugs would be vastly cheaper. In fact, according to one estimate, a dose of cocaine would cost less than 50 cents. That, proponents point out, would reduce drug-related crimes dramatically. When, for example, was the last time you heard of a gang killing connected with the distribution of cigarettes or alcoholic beverages?

The argument against legalization of drugs is largely moral: Should the state sanction potentially lethal substances? But there is an economic aspect to this position as well: The vastly lower street prices of drugs that would surely follow legalization would increase drug use. Thus, while legalization would almost certainly reduce crime, it may also produce more addicts. The key question here is, How many more addicts? (No one has a good answer.) If you think the increase in quantity demanded would be large, you are unlikely to find legalization an attractive option.



SOURCE: Chris Brown/Picturequest/Stock Boston

2. *An illegal, or “black,” market often arises to supply the commodity.* Usually some individuals are willing to take the risks involved in meeting unsatisfied demands illegally. Example: Although most states ban the practice, ticket “scalping” (the sale of tickets at higher than regular prices) occurs at most popular sporting events and rock concerts.
3. *The prices charged on illegal markets are almost certainly higher than those that would prevail in free markets.* After all, lawbreakers expect some compensation for the risk of being caught and punished. Example: Illegal drugs are normally quite expensive. (See the accompanying Policy Debate box, “Economic Aspects of the War on Drugs.”)
4. A substantial portion of the price falls into the hands of the illicit supplier instead of going to those who produce the good or perform the service. Example: A constant complaint during the public hearings that marked the history of theater-ticket price controls in New York City was that the “ice” (the illegal excess charge) fell into the hands of ticket scalpers rather than going to those who invested in, produced, or acted in the play.
5. *Investment in the industry generally dries up.* Because price ceilings reduce the monetary returns that investors can legally earn, less capital will be invested in industries that are subject to price controls. Even fear of impending price controls can have this effect. Example: Price controls on farm products in Zambia have prompted peasant farmers and large agricultural conglomerates

alike to cut back production rather than grow crops at a loss. The result has been thousands of lost jobs and widespread food shortages.

■ Case Study: Rent Controls in New York City

These points and others are best illustrated by considering a concrete example involving price ceilings. New York is the only major city in the United States that has continuously legislated rent controls in much of its rental housing, since World War II. Rent controls, of course, are intended to protect the consumer from high rents. But most economists believe that rent control does not help the cities or their residents and that, in the long run, it leaves almost everyone worse off. Elementary supply-demand analysis shows us why.

FIGURE 11
Supply-Demand
Diagram for Rental
Housing

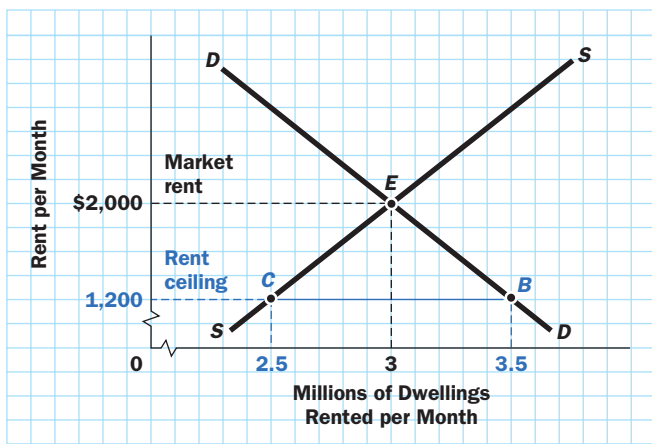


Figure 11 is a supply-demand diagram for rental units in New York. Curve DD is the demand curve and curve SS is the supply curve. Without controls, equilibrium would be at point E , where rents average \$2,000 per month and 3 million housing units are occupied. If rent controls are effective, the ceiling price must be below the equilibrium price of \$2,000. But with a low rent ceiling, such as \$1,200, the quantity of housing demanded will be 3.5 million units (point B) whereas the quantity supplied will be only 2.5 million units (point C).

The diagram shows a shortage of 1 million apartments. This theoretical concept of a “shortage” manifests itself in New York City as an abnormally low vacancy rate—typically about half the national urban average. Naturally, rent controls have spawned a lively black market in New York. The black market raises the effective price of rent-controlled apartments in many ways, including bribes, so-called key money paid to move up on a waiting list, or the requirement that prospective tenants purchase worthless furniture at inflated prices.

According to Figure 11, rent controls reduce the quantity supplied from 3 million to 2.5 million apartments. How does this reduction show up in New York? First, some property owners, discouraged by the low rents, have converted apartment buildings into office space or other uses. Second, some apartments have been inadequately maintained. After all, rent controls create a shortage, which makes even dilapidated apartments easy to rent. Third, some landlords have actually abandoned their buildings rather than pay rising tax and fuel bills. These abandoned buildings rapidly become eyesores and eventually pose threats to public health and safety.



"If you leave me, you know, you'll never see this kind of rent again."

SOURCE: © The New Yorker Collection, 1994 Richard Cline from cartoonbank.com. All Rights Reserved.

An important implication of these last observations is that rent controls—and price controls more generally—harm consumers in ways that offset part or all of the benefits to those who are fortunate enough to find and acquire at lower prices the product that the reduced prices has made scarce. Tenants must undergo long waits and undertake time-consuming searches to find an apartment, the apartment they obtain is likely to be poorly maintained or even decrepit, and normal landlord services are apt to disappear. Thus, even for the lucky beneficiaries, rent control is always far less of a bargain than the reduced monthly payments make them appear to be. The same problems generally apply with other forms of price control as well.

With all of these problems, why does rent control persist in New York City? And why do other cities sometimes move in the same direction?

Part of the explanation is that most people simply do not understand the problems that rent controls create. Another part is that landlords are unpopular politically. But a third, and very important, part of the explanation is that not everyone is hurt by rent controls—and those who benefit from controls fight hard to preserve them. In New York, for example, many tenants pay rents that are only a fraction of what their apartments would fetch on the open market. They are, naturally enough, quite happy with this situation. This last point illustrates another very general phenomenon:

Virtually every price ceiling or floor creates a class of people that benefits from the regulations. These people use their political influence to protect their gains by preserving the status quo, which is one reason why it is so difficult to eliminate price ceilings or floors.

■ Restraining the Market Mechanism: Price Floors

Interferences with the market mechanism are not always designed to keep prices low. Agricultural price supports and minimum wage laws are two notable examples in which the law keeps prices *above* free-market levels. Such **price floors** are typically accompanied by a standard series of symptoms:

1. *A surplus develops as sellers cannot find enough buyers.* Example: Surpluses of various agricultural products have been a persistent—and costly—problem for the U.S. government. The problem is even worse in the European Union (EU), where the common agricultural policy holds prices even higher. One source estimates that this policy accounts for half of all EU spending.⁷
2. *Where goods, rather than services, are involved, the surplus creates a problem of disposal.* Something must be done about the excess of quantity supplied over quantity demanded. Example: The U.S. government has often been forced to purchase, store, and then dispose of large amounts of surplus agricultural commodities.
3. *To get around the regulations, sellers may offer discounts in disguised—and often unwanted—forms.* Example: Back when airline fares were regulated by the government, airlines offered more and better food and more stylishly-uniformed flight attendants instead of lowering fares. Today, the food is worse, but tickets cost much less.
4. *Regulations that keep prices artificially high encourage overinvestment in the industry.* Even inefficient businesses whose high operating costs would doom them in an unrestricted market can survive beneath the shelter of a generous price floor. Example: This is why the airline and trucking industries both went through painful “shakeouts” of the weaker companies in the 1980s, after they were deregulated and allowed to charge market-determined prices.

Once again, a specific example is useful for understanding how price floors work.

■ Case Study: Farm Price Supports and the Case of Sugar Prices

America’s extensive program of farm price supports began in 1933 as a “temporary method of dealing with an emergency”—in the years of the Great Depression, farmers were going broke in droves. These price supports are still with us today, even though farmers account for less than 2 percent of the U.S. workforce.⁸

A **price floor** is a legal minimum below which the price charged for a commodity is not permitted to fall.

⁷ *The Economist*, February 20, 1999.

⁸ Under major legislation passed in 1996, many agricultural price supports were supposed to be phased out over a seven-year period. In reality, many support programs, especially that for sugar, have changed little.

One of the consequences of these price supports has been the creation of unsellable surpluses—more output of crops such as grains than consumers were willing to buy at the inflated prices yielded by the supports. Warehouses were filled to overflowing. New storage facilities had to be built, and the government was forced to set up programs in which grain from the unmanageable surpluses was shipped to poor foreign countries to combat malnutrition and starvation in those nations. Realistically, if price supports are to be effective in keeping prices above the equilibrium level, then *someone* must be prepared to purchase the surpluses that invariably result. Otherwise, those surpluses will somehow find their way into the market and drive down prices, undermining the price support program. In the United States (and elsewhere), the buyer of the surpluses has usually turned out to be the government, which makes its purchases at the expense of taxpayers who are forced to pay twice—once through taxes to finance the government purchases, and a second time in the form of higher prices for the farm products bought by the American public.

One of the more controversial farm price supports involves the U.S. sugar industry. Sugar producers receive low-interest loans from the federal government and a guarantee that the price of sugar will not fall below a certain level.

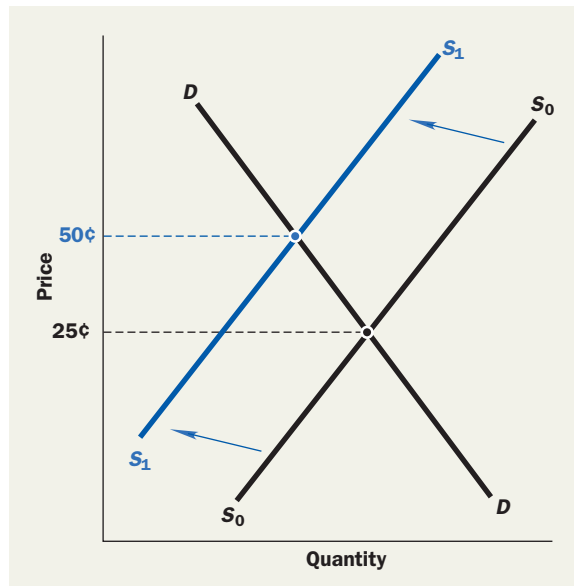
In a market economy such as that found in the United States, Congress cannot simply set prices by decree; rather, it must take some action to enforce the price floor. In the case of sugar, that “something” is limiting both domestic production and foreign imports, thereby shifting the supply curve inward to the left. Figure 12 shows the mechanics involved in this price floor. Government policies shift the supply curve inward from S_0S_0 to S_1S_1 and drive the U.S. price up from 25¢ to 50¢ per pound. The more the supply curve shifts inward, the higher the price.

The sugar industry obviously benefits from the price-control program. But consumers pay for it in the form of higher prices for sugar and sugar-filled products such as soft drinks, candy bars, and cookies. Although estimates vary, the federal sugar price support program appears to cost consumers approximately \$1.5 billion per year.

If all of this sounds a bit abstract to you, take a look at the ingredients in a U.S.-made soft drink. Instead of sugar, you will likely find “high-fructose corn syrup” listed as a sweetener. Foreign producers generally use sugar, but sugar is simply too expensive to be used for this purpose in the United States.

FIGURE 12

Supporting the Price of Sugar



■ A Can of Worms

Our two case studies—rent controls and sugar price supports—illustrate some of the major side effects of price floors and ceilings, but barely hint at others. Difficulties arise that we have not even mentioned, for the market mechanism is a tough bird that imposes suitable retribution on those who seek to evade it by government decree. Here is a partial list of other problems that may arise when prices are controlled.

Favoritism and Corruption

When price ceilings or floors create shortages or surpluses, someone must decide who gets to buy or sell the limited quantity that is available. This decision-making process can lead to discrimination along racial or religious lines, political favoritism, or corruption in government. For example, many prices were held at artificially low levels in the former Soviet Union, making queuing for certain goods quite common. Even so, Communist Party officials and other favored groups were somehow able to purchase the scarce commodities that others could not get.

Unenforceability Attempts to limit prices are almost certain to fail in industries with numerous suppliers, simply because the regulating agency must monitor the behavior of so many sellers. People will usually find ways to evade or violate the law, and something like the free-market price will generally reappear. But there is an important difference: Because the evasion process, whatever its form, will have some operating costs, those costs must be borne by someone. Normally, that someone is the consumer who must pay higher prices to the suppliers for taking the risk of breaking the law.

Auxiliary Restrictions Fears that a system of price controls will break down invariably lead to regulations designed to shore up the shaky edifice. Consumers may be told when and from whom they are permitted to buy. The powers of the police and the courts may be used to prevent the entry of new suppliers. Occasionally, an intricate system of market subdivision is imposed, giving each class of firms a protected sphere in which others are not permitted to operate. For example, in New York City, there are laws banning conversion of rent-controlled apartments to condominiums.

Limitation of Volume of Transactions To the extent that controls succeed in affecting prices, they can be expected to reduce the volume of transactions. Curiously, this is true regardless of whether the regulated price is above or below the free-market equilibrium price. If it is set above the equilibrium price, the quantity demanded will be below the equilibrium quantity. On the other hand, if the imposed price is set below the free-market level, the quantity supplied will be reduced. Because sales volume cannot exceed either the quantity supplied or the quantity demanded, a reduction in the volume of transactions is the result.⁹

Misallocation of Resources Departures from free-market prices are likely to result in misuse of the economy's resources because the connection between production costs and prices is broken. For example, Russian farmers used to feed their farm animals bread instead of unprocessed grains because price ceilings kept the price of bread ludicrously low. In addition, just as more complex locks lead to more sophisticated burglary tools, more complex regulations lead to the use of yet more resources for their avoidance.

Economists put it this way: Free markets are capable of dealing efficiently with the three basic coordination tasks outlined in Chapter 3: deciding what to produce, how to produce it, and to whom the goods should be distributed. Price controls throw a monkey wrench into the market mechanism. Although the market is surely not flawless, and government interferences often have praiseworthy goals, good intentions are not enough. Any government that sets out to repair what it sees as a defect in the market mechanism runs the risk of causing even more serious damage elsewhere. As a prominent economist once quipped, societies that are too willing to interfere with the operation of free markets soon find that the invisible hand is nowhere to be seen.

⁹ See Discussion Question 4 at the end of this chapter.

A SIMPLE BUT POWERFUL LESSON

Astonishing as it may seem, many people in authority do not understand the law of supply and demand, or they act as if it does not exist. For example, a few years ago the *New York Times* carried a dramatic front-page picture of the president of Kenya setting fire to a large pile of elephant tusks that had been confiscated from poachers. The accompanying story explained that the burning was intended as a symbolic act to persuade the world to halt the ivory trade.¹⁰ One may certainly doubt whether the burning really touched the hearts of criminal poachers, but one economic effect was clear: By reducing the supply of ivory on the world market, the burning of tusks forced up the price of ivory, which raised the illicit rewards reaped by those who slaughter elephants. That could only encourage more poaching—precisely the opposite of what the Kenyan government sought to accomplish.

SUMMARY

1. An attempt to use government regulations to force prices above or below their equilibrium levels is likely to lead to **shortages** or **surpluses**, to black markets in which goods are sold at illegal prices, and to a variety of other problems. The market always strikes back at attempts to repeal the law of supply and demand.
2. The quantity of a product that is demanded is not a fixed number. Rather, **quantity demanded** depends on such factors as the price of the product, consumer incomes, and the prices of other products.
3. The relationship between quantity demanded and price, holding all other things constant, can be displayed graphically on a **demand curve**.
4. For most products, the higher the price, the lower the quantity demanded. As a result, the demand curve usually has a negative slope.
5. The quantity of a product that is supplied depends on its price and many other influences. A **supply curve** is a graphical representation of the relationship between **quantity supplied** and price, holding all other influences constant.
6. For most products, supply curves have positive slopes, meaning that higher prices lead to supply of greater quantities.
7. A change in quantity demanded that is caused by a change in the price of the good is represented by a movement *along* a fixed demand curve. A change in quantity demanded that is caused by a change in any other determinant of quantity demanded is represented by a **shift of the demand curve**.
8. This same distinction applies to the supply curve: Changes in price lead to movements along a fixed supply curve; changes in other determinants of quantity supplied lead to shifts of the entire supply curve.
9. A market is said to be in **equilibrium** when quantity supplied is equal to quantity demanded. The equilibrium price and quantity are shown by the point on the supply-demand graph where the supply and demand curves intersect. The **law of supply and demand** states that price and quantity tend to gravitate to this point in a free market.
10. Changes in consumer incomes, tastes, technology, prices of competing products, and many other influences lead to shifts in either the demand curve or the supply curve and produce changes in price and quantity that can be determined from **supply-demand diagrams**.
11. A tax on a good generally leads to a rise in the price at which the taxed product is sold. The rise in price is generally less than the tax, so consumers usually pay less than the entire tax.
12. Consumers generally pay only part of a tax because the resulting rise in price leads them to buy less and the cut in the quantity they demand helps to force price down.

KEY TERMS

Invisible hand	52	Quantity supplied	57	Surplus	61
Quantity demanded	53	Supply schedule	57	Equilibrium	61
Demand schedule	54	Supply curve	58	Law of supply and demand	62
Demand curve	54	Supply-demand diagram	60	Price ceiling	66
Shift in a demand curve	55	Shortage	61	Price floor	69

¹⁰ *The New York Times*, July 19, 1989.

TEST YOURSELF

1. What shapes would you expect for demand curves for the following:
 - a. A medicine that means life or death for a patient
 - b. French fries in a food court with kiosks offering many types of food
2. The following are the assumed supply and demand schedules for hamburgers in Collegetown:

Demand Schedule		Supply Schedule	
Price	Quantity Demanded per Year (thousands)	Price	Quantity Supplied per Year (thousands)
\$2.25	12	\$2.25	30
2.00	16	2.00	28
1.75	20	1.75	26
1.50	24	1.50	24
1.25	28	1.25	22
1.00	32	1.00	20

- a. Plot the supply and demand curves and indicate the equilibrium price and quantity.
 - b. What effect would a decrease in the price of beef (a hamburger input) have on the equilibrium price and quantity of hamburgers, assuming all other things remained constant? Explain your answer with the help of a diagram.
 - c. What effect would an increase in the price of pizza (a substitute commodity) have on the equilibrium price and quantity of hamburgers, assuming again that all other things remain constant? Use a diagram in your answer.
3. Suppose the supply and demand schedules for bicycles are as they appear below.
 - a. Graph these curves and show the equilibrium price and quantity.

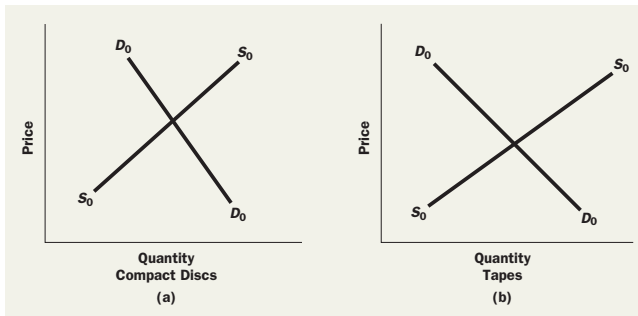
Price	Quantity Demanded per Year (millions)	Quantity Supplied per Year (millions)
\$160	40	24
200	36	28
240	32	32
280	28	36
320	24	40
360	20	44

- b. Now suppose that it becomes unfashionable to ride a bicycle, so that the quantity demanded at each price falls by 8 million bikes per year. What is the new equilibrium price and quantity? Show this solution graphically. Explain why the quantity falls by less than 8 million bikes per year.
 - c. Suppose instead that several major bicycle producers go out of business, thereby reducing the quantity supplied by 8 million bikes at every price. Find the new equilibrium price and quantity, and show it graphically. Explain again why quantity falls by less than 8 million.
 - d. What are the equilibrium price and quantity if the shifts described in Test Yourself Questions 3(b) and 3(c) happen at the same time?
4. The following table summarizes information about the market for principles of economics textbooks:

Price	Quantity Demanded per Year	Quantity Supplied per Year
\$40	4,200	200
50	2,200	600
60	1,200	1,200
70	700	2,000
80	550	3,000

- a. What is the market equilibrium price and quantity of textbooks?
 - b. To quell outrage over tuition increases, the college places a \$50 limit on the price of textbooks. How many textbooks will be sold now?
 - c. While the price limit is still in effect, automated publishing increases the efficiency of textbook production. Show graphically the likely effect of this innovation on the market price and quantity.
5. How are the following demand curves likely to shift in response to the indicated changes?
 - a. The effect of a drought on the demand curve for umbrellas
 - b. The effect of higher popcorn prices on the demand curve for movie tickets
 - c. The effect on the demand curve for coffee of a decline in the price of Coca-Cola

6. The two accompanying diagrams show supply and demand curves for two substitute commodities: tapes and compact discs (CDs).



- On the right-hand diagram, show what happens when rising raw material prices make it costlier to produce tapes.
 - On the left-hand diagram, show what happens to the market for CDs.
7. Consider the market for milk discussed in this chapter (Tables 1 through 4 and Figures 1 and 8). Suppose that the government decides to fight kidney stones by levying a tax of 40 cents per quart on sales of milk. Follow these steps to analyze the effects of the tax:
- Construct the new supply schedule (to replace Table 2) that relates quantity supplied to the price that consumers pay.
 - Graph the new supply curve constructed in Test Yourself Question 7(a) on the supply-demand diagram depicted in Figure 7. What are the new equilibrium price and quantity?

- Does the tax succeed in its goal of reducing the consumption of milk?
 - How much does the equilibrium price increase? Is the price rise greater than, equal to, or less than the 40-cent tax?
 - Who actually pays the tax, consumers or producers? (This may be a good question to discuss in class.)
8. (More difficult) The demand and supply curves for T-shirts in Touristtown, U.S.A., are given by the following equations:

$$Q = 24,000 - 500P \quad Q = 6,000 + 1,000P$$

where P is measured in dollars and Q is the number of T-shirts sold per year.

- Find the equilibrium price and quantity algebraically.
- If tourists decide they do not really like T-shirts that much, which of the following might be the new demand curve?

$$Q = 21,000 - 500P \quad Q = 27,000 - 500P$$

Find the equilibrium price and quantity after the shift of the demand curve.

- If, instead, two new stores that sell T-shirts open up in town, which of the following might be the new supply curve?

$$Q = 4,000 + 1,000P \quad Q = 9,000 + 1,000P$$

Find the equilibrium price and quantity after the shift of the supply curve.

DISCUSSION QUESTIONS

- How often do you rent videos? Would you do so more often if a rental cost half as much? Distinguish between your demand curve for home videos and your “quantity demanded” at the current price.
- Discuss the likely effects of the following:
 - Rent ceilings on the market for apartments
 - Floors under wheat prices on the market for wheat
 Use supply-demand diagrams to show what may happen in each case.
- U.S. government price supports for milk led to an unceasing surplus of milk. In an effort to reduce the surplus about a decade ago, Congress offered to pay dairy farmers to slaughter cows. Use two diagrams, one for the milk market and one for the meat market, to illustrate how this policy should have affected the price of meat. (Assume that meat is sold in an unregulated market.)
- It is claimed in this chapter that either price floors or price ceilings reduce the actual quantity exchanged in a market. Use a diagram or diagrams to test this conclusion, and explain the common sense behind it.
- The same rightward shift of the demand curve may produce a very small or a very large increase in quantity, depending on the slope of the supply curve. Explain this conclusion with diagrams.
- In 1981, when regulations were holding the price of natural gas below its free-market level, then-Congressman Jack Kemp of New York said the following in an interview with the *New York Times*: “We need to decontrol natural gas, and get production of natural gas up to a higher level so we can bring down the price.”¹¹ Evaluate the congressman’s statement.
- From 1990 to 1997 in the United States, the number of working men grew by 6.7 percent; the number of working women grew by 11 percent. During this time, average wages for men grew by 20 percent, while average wages for women grew by 25 percent. Which of the following two explanations seems more consistent with the data?
 - Women decided to work more, raising their relative supply (relative to men).
 - Discrimination against women declined, raising the relative (to men) demand for female workers.

¹¹ *The New York Times*, December 24, 1981.