

Supply, Demand, and the Market Process



I am convinced that if [the market system] were the result of deliberate human design, and if the people guided by the price changes understood that their decisions have significance far beyond their immediate aim, this mechanism would have been acclaimed as one of the greatest triumphs of the human mind.

—Friedrich Hayek,
Nobel Laureate¹

From the point of view of physics, it is a miracle that [7 million New Yorkers are fed each day] without any control mechanism other than sheer capitalism.

—John H. Holland, scientist,
Santa Fe Institute²

CHAPTER FOCUS

- What are the laws of demand and supply?
- How do consumers decide whether to purchase a good? How do producers decide whether to supply it?
- How do buyers and sellers respond to changes in the price of a good?
- What role do profits and losses play in an economy? What must a firm do to make a profit?
- How is the market price of a good determined?
- How do markets adjust to changes in demand? How do they adjust to changes in supply?
- What is the “invisible hand” principle?

¹Friedrich Hayek, “The Use of Knowledge in Society,” *American Economic Review* 35 (September 1945): 519–30.

²As quoted by Russell Ruthen in “Adapting to Complexity,” *Scientific American* 268 (January 1993): 132.

To those who study art, the *Mona Lisa* is much more than a famous painting of a woman. Looking beyond the overall picture, they see and appreciate the brush strokes, colors, and techniques embodied in the painting. Similarly, studying economics can help you to gain an appreciation for the details behind many things in your everyday life. During your last visit to the grocery store, you probably noticed the fruit and vegetable section. Next time, take a moment to ponder how potatoes from Idaho, oranges from Florida, apples from Washington, bananas from Honduras, kiwi fruit from New Zealand, and other items from around the world got there. Literally thousands of different individuals, *working independently*, were involved in the process. Their actions were so well coordinated, in fact, that the amount of each good was just about right to fill exactly the desires of your local community. Furthermore, even the goods shipped from halfway around the world were fresh and reasonably priced.

How does all this happen? The short answer is that it is the result of market prices and the incentives and coordination that flow from them. To the economist, the operation of markets—including your local grocery market—is like the brush strokes underlying a beautiful painting. Reflecting on this point, Friedrich Hayek speculates that if the market system had been deliberately designed, it would be “acclaimed as one of the greatest triumphs of the human mind.” Similarly, computer scientist John H. Holland argues that, from the viewpoint of physics, the feeding of millions of New Yorkers day after day with very few shortages or surpluses is a miraculous feat (see the quotations at the chapter opening).

Amazingly, markets coordinate the actions of millions of individuals *without* central planning. There is no individual, political authority, or central planning committee in charge. Considering that there are nearly 300 million Americans with widely varying skills and desires, and roughly 25 million businesses producing a vast array of products ranging from diamond rings to toilet paper, the coordination derived from markets is indeed an awesome achievement.

This chapter focuses on supply, demand, and the determination of market prices. For now, we will analyze the operation of competitive markets—that is, markets in which buyers and sellers are free to enter and exit. We will also assume that the property rights are well defined. Later, we will consider what happens when these conditions are absent.



Kayte M. DeIoma/PhotoEdit

The produce section of your local grocery store is a great place to see economics in action. Literally millions of individuals from around the world have been involved in the process of getting these goods to the shelves in just the right quantities. Market prices underlie this feat.

On eBay, sellers enter their reserve prices—the minimum prices they will accept for goods; buyers enter their maximum bids—the maximum prices they are willing to pay for goods. The process works the same way when a person runs a newspaper ad to sell a car. The seller has in mind a minimum price he or she will accept for the car. A potential buyer, on the other hand, has in mind a maximum price he or she will pay for the car. If the buyer's maximum price is greater than the seller's minimum price, the exchange will occur at a price somewhere in between. As these examples show, the buyers' and sellers' desires and incentives determine prices and make markets work. We will begin with the demand (buyer's) side, and then turn to the supply (seller's) side of the market. ■

Consumer Choice and the Law of Demand

Clearly, prices influence our decisions. As the price of a good increases, we have to give up more of *other* goods if we want to buy it. Thus, as the price of a good rises, its opportunity cost increases (in terms of other goods that must be forgone to purchase it).

A basic principle of economics is that if something becomes more costly, people will be less likely to buy it. This principle is called the **law of demand**. *The law of demand states that there is an inverse (or negative) relationship between the price of a good or service and the quantity of it that consumers are willing to purchase.* This inverse relationship means that price and the quantity consumers wish to purchase move in opposite directions. As the price increases, buyers purchase less—and as the price decreases, buyers purchase more.

The availability of **substitutes**—goods that perform similar functions—helps explain this inverse relationship. No single good is absolutely essential; everything can be replaced with something else. A chicken sandwich can be substituted for a cheeseburger. Wood, aluminum, bricks, and glass can take the place of steel. Going to the movies, playing tennis, watching television, and going to a football game are substitute forms of entertainment. When the price of a good increases, people cut back on their purchases of it and turn to substitute products.

Law of demand

A principle that states there is an inverse relationship between the price of a good and the quantity of it buyers are willing to purchase. As the price of a good increases, consumers will wish to purchase less of it. As the price decreases, consumers will wish to purchase more of it.

Substitutes

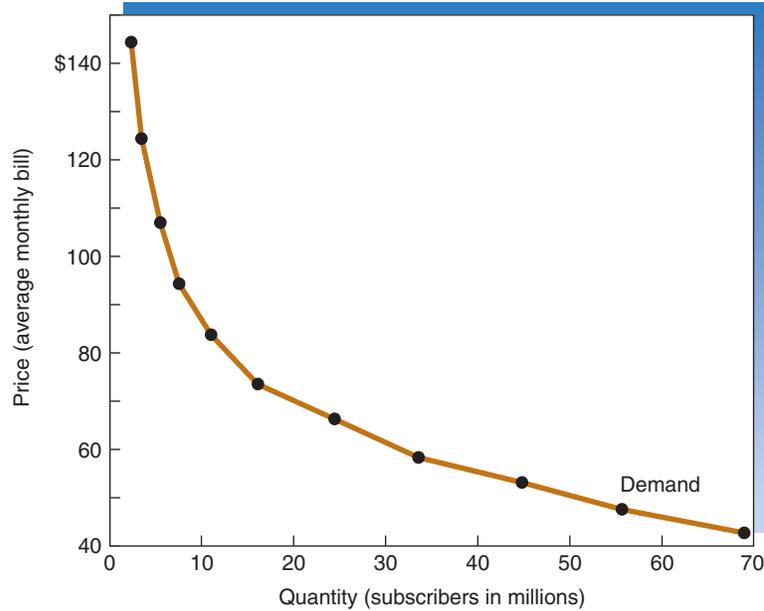
Products that serve similar purposes. An increase in the price of one will cause an increase in demand for the other (examples are hamburgers and tacos, butter and margarine, Microsoft Xbox and Sony PlayStation, Chevrolets and Fords).

The Market Demand Schedule

The lower portion of **EXHIBIT 1** shows a hypothetical *demand schedule* for cellular telephone service.³ A demand schedule is simply a table listing the various quantities of something consumers are willing to purchase at different prices. In Exhibit 1, notice that the price is the average monthly cost of purchasing cellular phone service. The quantity demanded is the number of people willing to subscribe to cellular service at each price. When the price of cell phone service is \$143 per month, just over 2 million people subscribe. As the price falls to \$85, the quantity of subscribers rises to 11 million; when the price falls to \$41 per month, the quantity of subscribers increases to just over 69 million.

The upper portion of Exhibit 1 shows what the demand schedule would look like if the various prices and corresponding quantity of subscribers were plotted on a graph and connected by a line. This is called the *demand curve*. When representing the demand schedule graphically, economists measure price on the vertical or *y*-axis, and the amount demanded on the horizontal or *x*-axis. Because of the inverse relationship between price and amount purchased, the demand curve will have a negative slope—that is, it will slope downward to the right. More of a good will be purchased as its price decreases. This is the law of demand.

³These data are actual prices (adjusted to 2000 dollars) and quantities annually for 1988 to 1998 taken from *Statistical Abstract of the United States* (Washington, DC: U.S. Bureau of the Census, various years). *If we could assume that other demand determinants (income, prices of related goods, and so on) had remained constant*, then this hypothetical demand schedule would be accurate for that time period. Because it is possible that some of these other factors changed, we treat the numbers as hypothetical, depicting alternative prices and quantities *at a given time*.



CELLULAR PHONE PRICE (AVERAGE MONTHLY BILL)	QUANTITY OF CELLULAR PHONE SUBSCRIBERS (IN MILLIONS)
--	---

\$143	2.1
124	3.5
107	5.3
92	7.6
85	11.0
73	16.0
65	24.1
58	33.7
53	44.0
46	55.3
41	69.2

EXHIBIT 1 Law of Demand

As the demand schedule shown in the table indicates, the number of people subscribing to cellular phone service (just like the consumption of other products) is inversely related to price. The data from the table are plotted as a demand curve in the graph. The inverse relationship between price and amount demanded reflects the fact that consumers will substitute away from a good as it becomes more expensive.

Read horizontally, the demand curve shows how much of a particular good consumers are willing to buy at a given price. Read vertically, the demand curve shows how much consumers value the good. The height of the demand curve at any quantity shows the maximum price consumers are willing to pay for an additional unit. If consumers value highly an additional unit of a product, they will be willing to pay a large amount for it. Conversely, if they place a low value on the additional unit, they will be willing to pay only a small amount for it.

Because the amount a consumer is willing to pay for a good is directly related to the good's value to them, the demand curve indicates the marginal benefit (or value) consumers receive from additional units. (Recall that we briefly discussed marginal benefit in Chapter 1.) When viewed in this manner, the demand curve reveals that as consumers have more and more of a good or service, they value additional units less and less.

Consumer Surplus

Previously, we indicated that voluntary exchanges make both buyers and sellers better off. The demand curve can be used to illustrate the gains to consumers. Suppose you value a particular good at \$50, but you are able to purchase it for only \$30. Your net gain from buying the good is the \$20 difference. Economists call this net gain of buyers **consumer surplus**. Consumer surplus is simply the difference between the maximum amount consumers would be willing to pay and the amount they actually pay for a good.

Consumer surplus

The difference between the maximum price consumers are willing to pay and the price they actually pay. It is the net gain derived by the buyers of the good.

EXHIBIT 2 Consumer Surplus

Consumer surplus is the area below the demand curve but above the actual price paid. This area represents the net gains to buyers from market exchange.

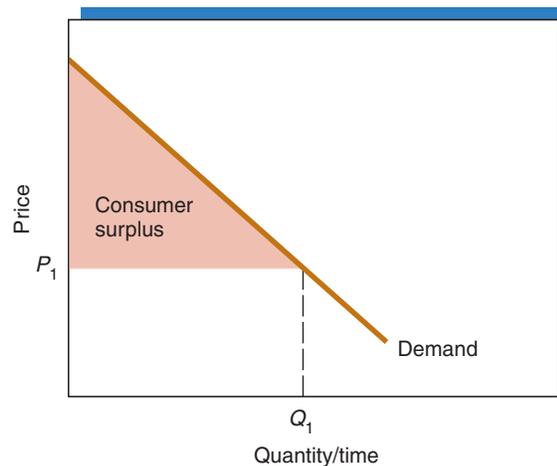


EXHIBIT 2 shows the consumer surplus for an entire market. The height of the demand curve measures how much buyers in the market value each unit of the good. The price indicates the amount they actually pay. The difference between these two—the triangular area below the demand curve but above the price paid—is a measure of the total consumer surplus generated by all exchanges of the good. The size of the consumer surplus, or triangular area, is affected by the market price. If the market price for the good falls, more of it will be purchased, resulting in a larger surplus for consumers. Conversely, if the market price rises, less of it will be purchased, resulting in a smaller surplus (net gain) for consumers.

Because the value a consumer places on a particular unit of a good is shown by the corresponding height of the demand curve, we can use the demand curve to clarify the difference between the *marginal value* and *total value* of a good—a distinction we introduced briefly in Chapter 1. Returning to Exhibit 2, if consumers are currently purchasing Q_1 units, the marginal value of the good is indicated by the height of the demand curve at Q_1 —the last unit consumed (or purchased). So at each quantity, the height of the demand curve shows the marginal value of that unit, which as you can see declines along a demand curve. The *total value* of the good, however, is equal to the combined value of all units purchased. This is the sum of the value of each unit (the heights along the demand curve) on the x -axis, out to and including unit Q_1 . This total value is indicated graphically as the entire area under the demand curve out to Q_1 (the triangular area representing consumer surplus *plus* the unshaded rectangular area directly below it).

You can see that the total value to consumers of a good can be far greater than the marginal value of the last unit consumed. When additional units are available at a low price, the marginal value of a good may be quite low, even though its total value to consumers is exceedingly high. This is usually the case with water, for example, because it is essential for life. The value of the first few units of water consumed per day will be exceedingly high. The consumer surplus derived from these units will also be large when water is plentiful at a low price. As more and more units are consumed, however, the *marginal value* of even something as important as water will fall to a low level. When water is cheap, then, people will use it not only for drinking, cleaning, and cooking but also for washing cars, watering lawns, flushing toilets, and maintaining fish aquariums. Thus, although the total value of water is rather large, its marginal value is quite low.

Consumers will tend to expand their consumption of a good until its price and *marginal value* are equal (which occurs at Q_1 in Exhibit 2 at a price of P_1). Thus, the price of a good (which equals marginal value) reveals little about the *total value* derived from the consumption of it. This is the reason that the market price of diamonds (which reflects their high marginal value) is greater than the market price of water (which has a low marginal value), even though the total value of diamonds is far less than the total value

of water. Think of it this way: beginning from your current levels of consumption, if you were offered a choice between one diamond or one gallon of water right now, which would you take? You would probably take the diamond, because at the margin it has more value to you than additional water. However, if given a choice between giving up *all* of the water you use or *all* of the diamonds you have, you would probably keep the water over diamonds, because water has more total value to you.

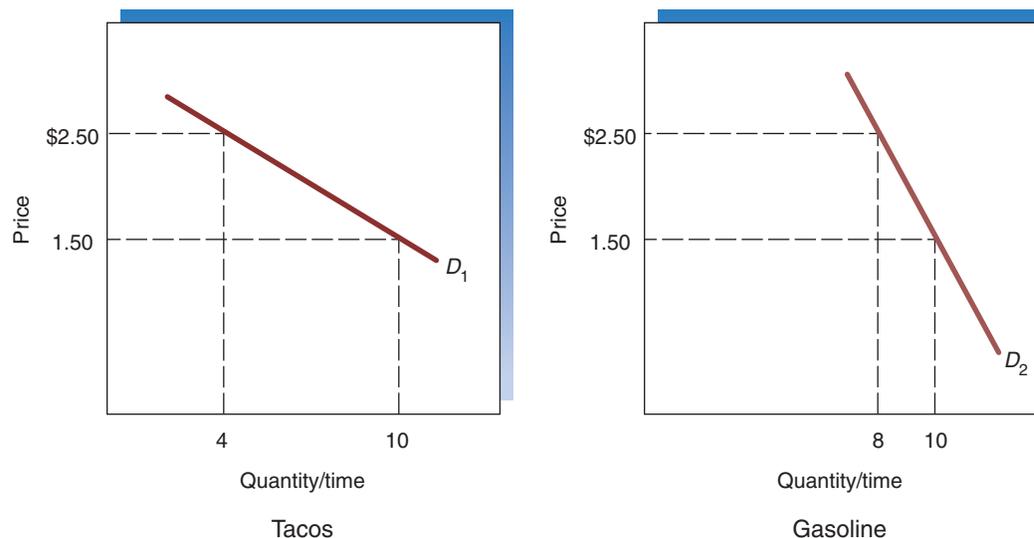
Responsiveness of Quantity Demanded to Price Changes: Elastic and Inelastic Demand Curves

As we previously noted, the availability of substitutes is the main reason why the demand curve for a good slopes downward. Some goods, however, are much easier than others to substitute away from. As the price of tacos rises, most consumers find hamburgers a reasonable substitute. Because of the ease of substitutability, the quantity of tacos demanded is quite sensitive to a change in their price. Economists would say that the demand for tacos is relatively *elastic* because a small price change will cause a rather large change in the amount purchased. Alternatively, goods like gasoline and electricity have fewer close substitutes. When their prices rise, it is harder for consumers to find substitutes for these products. When close substitutes are unavailable, even a large price change may not cause much of a change in the quantity demanded. In this case, an economist would say that the demand for such goods is relatively *inelastic*.

Graphically, this different degree of responsiveness is reflected in the steepness of the demand curve, as shown in **EXHIBIT 3**. The flatter demand curve (D_1 , left frame) is for a product like tacos, for which the quantity purchased is highly responsive to a change in price. As the price increases from \$1.50 to \$2.50, the quantity demanded falls sharply from ten to four units. The steeper demand curve (D_2 , right frame) is for a product like gasoline, for which the quantity purchased is much less responsive to a change in price. For gasoline, an increase in price from \$1.50 to \$2.50 results in only a small reduction in the quantity purchased (from ten to eight units). An economist would say that the flatter

EXHIBIT 3 Elastic and Inelastic Demand Curves

The responsiveness of consumer purchases to a change in price is reflected in the steepness of the demand curve. The flatter demand curve (D_1) for tacos shows a higher degree of responsiveness and is called relatively elastic, while the steeper demand curve (D_2) for gasoline shows a lower degree of responsiveness and is called relatively inelastic.



demand curve D_1 is “relatively elastic,” whereas the steeper demand curve D_2 is “relatively inelastic.” The availability of substitutes is the main determinant of a product’s elasticity or inelasticity and thus how flat or steep its demand curve is.

What would a demand curve that was perfectly vertical represent? Economists refer to this as a “perfectly” inelastic demand curve. It would mean that the quantity demanded of the product never changes—regardless of its price. Although it is tempting to think that the demand curves are vertical for goods essential to human life (or goods that are addictive), this is inaccurate for two reasons. First, in varying degrees, there are substitutes for everything. As the price of a good rises, the incentive increases for suppliers to invent even more substitutes. Thus, even for goods that currently have few substitutes, if the price were to rise high enough, alternatives would be invented and marketed, reducing the quantity demanded of the original good. Second, our limited incomes restrict our ability to afford goods when they become very expensive. As the price of a good rises to higher and higher levels, if we do not cut back on the quantity purchased, we will have less and less income to spend on other things. Eventually, this will cause us to cut back on our purchases of it. Because of these two reasons, the demand curve for every good will slope downward to the right.

Changes in Demand versus Changes in Quantity Demanded

The purpose of the demand curve is to show what effect a price change will have on the quantity demanded (or purchased) of a good. Economists refer to a change in the quantity of a good purchased in response solely to a price change as a “change in *quantity demanded*.” A change in quantity demanded is simply a movement along a demand curve from one point to another.

Changes in factors other than a good’s price—such as consumers’ income and the prices of closely related goods—will also influence the decisions of consumers to purchase a good. If one of these other factors changes, the entire demand curve will *shift* inward or outward. Economists refer to a shift in the demand curve as a “change in *demand*.”

Failure to distinguish between a change in demand and a change in quantity demanded is one of the most common mistakes made by beginning economics students.⁴ ***A change in demand is a shift in the entire demand curve. A change in quantity demanded is a movement along the same demand curve.*** The easiest way to distinguish between these two concepts is the following: If the change in consumer purchases is caused by a change in the price of the good, it is a change in quantity demanded—a movement along the demand curve. If the change in consumer purchases is due to a change in anything other than the price of the good (a change in consumer income, for example), it is a change in demand—a shift in the demand curve.

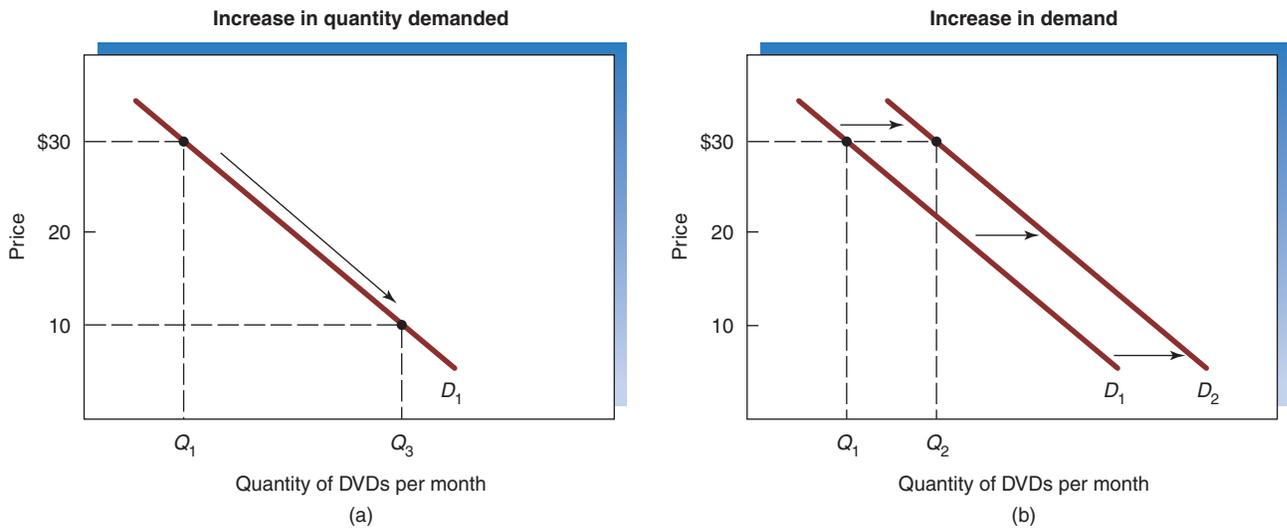
Let us now take a closer look at some of the factors that cause a “change in demand”—an inward or outward shift in the entire demand curve.

1. CHANGES IN CONSUMER INCOME. An increase in consumer income makes it possible for consumers to purchase more goods. If you were to win the lottery, or if your boss were to give you a raise, you would respond by increasing your spending on many products. Alternatively, when the economy goes into a recession, falling incomes and rising unemployment cause consumers to reduce their purchases of many items. A change in consumer income will result in consumers buying more or less of a product at all possible prices. When consumer income increases, in the case of most goods, individuals will purchase more of the good even if the price is unchanged. This is shown by a shift to the right—an outward shift—in the demand curve. Such a shift is called an increase in demand. A reduction in consumer income generally causes a shift to the left—an inward shift—in the demand curve, which

⁴Questions designed to test the ability of students to make this distinction are favorites of many economics instructors. A word to the wise should be sufficient.

EXHIBIT 4**Change in Demand versus Change in Quantity Demanded**

Panel (a) shows a change in quantity demanded, a movement along the demand curve D_1 , in response to a change in the price of DVDs. Panel (b) shows a change in demand, a shift of the entire curve, in this case due to an increase in consumer income.



is called a decrease in demand. Note that the appropriate terminology here is an increase or decrease in demand, not an increase or decrease in quantity demanded.

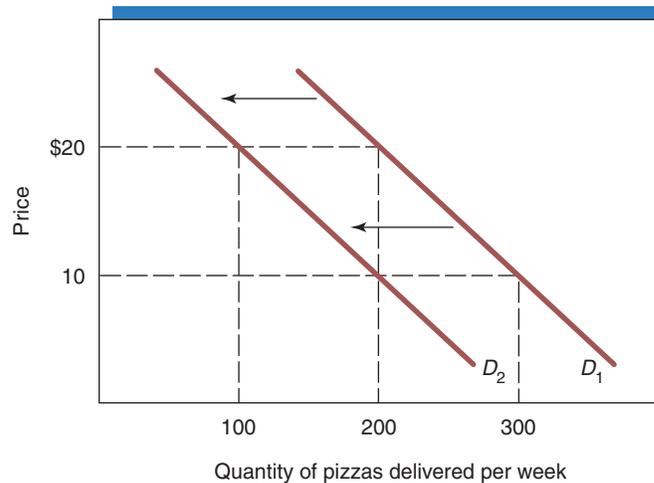
EXHIBIT 4 highlights the difference between a change in demand and a change in quantity demanded. The demand curve D_1 indicates the initial demand curve for DVDs. At a price of \$30, consumers will purchase Q_1 units. If the price were to decline to \$10, the *quantity demanded* would increase from Q_1 to Q_3 . The arrow in panel (a) indicates the change in *quantity demanded*—a movement along the original demand curve D_1 in response to the change in price. Now, alternatively suppose there were an increase in income that caused the *demand* for DVDs to shift from D_1 to D_2 . As indicated by the arrows in panel (b), the entire demand curve would shift outward. At the higher income level, consumers would be willing to purchase more DVDs than before. This is true at a price of \$30, \$20, \$10, and every other price. The increase in income leads to an increase in *demand*—a shift in the entire curve.

2. CHANGES IN THE NUMBER OF CONSUMERS IN THE MARKET. Businesses that sell products in college towns are greatly saddened when summer arrives. As you might expect in these towns, the demand for many items—from pizza delivery to beer—falls during the summer. **EXHIBIT 5** shows how the falling number of consumers in the market caused by students going home for the summer affects the demand for pizza delivery. With fewer customers, the demand curve shifts inward from D_1 to D_2 . There is a decrease in demand; pizza stores sell fewer pizzas than before regardless of what price they originally charged. Had their original price been \$20, then demand would fall from 200 pizzas per week to only 100. Alternatively, had their original price been \$10, then demand would fall from 300 pizzas to 200. When autumn arrives and the students come back to town, there will be an increase in demand that will restore the curve to about its original position. As cities grow and shrink, and as international markets open up to domestic firms, changes in the number of consumers affect the demand for many products.

3. CHANGES IN THE PRICE OF A RELATED GOOD. Changes in prices of closely related products also influence the choices of consumers. Related goods may be either

EXHIBIT 5 A Decrease in Demand

In college towns, the demand for pizza delivery decreases substantially when students go home for the summer. A decrease in demand is a leftward shift in the entire demand curve. Fewer pizzas are demanded at every price.



substitutes or complements. When two products perform similar functions or fulfill similar needs, they are substitutes. Economists define goods as substitutes when there is a direct relationship between the price of one and the demand for the other—meaning an increase in the price of one leads to an increase in demand for the other (they move in the same direction). For example, margarine is a substitute for butter. If the price of butter rises, it will increase the demand for margarine as consumers substitute margarine for the more expensive butter. Conversely, lower butter prices will reduce the demand for margarine, shifting the entire demand curve for margarine to the left.

Gasoline and hybrid cars provide another example of a substitute relationship. As gasoline prices have risen in recent years, the demand for gas–electric hybrid cars has increased. Beef and chicken, pencils and pens, apples and oranges, and coffee and tea provide other examples of substitutes.

Note that although a change in the price of butter shifts the demand curve for margarine (a change in demand), it will only result in a movement along the demand curve for butter (a change in the quantity demanded). The reason is that the demand curve for butter already shows the relationship between the price of butter and the quantity of butter desired. An increase in the price of butter makes consumers willing to purchase more margarine, holding constant the price of margarine.

Other products are consumed jointly, so the demands for them are linked together as well. Examples of goods that “go together” include peanut butter and jelly, DVDs and DVD players, hot dogs and hot dog buns, and tents and other camping equipment. These goods are called **complements**. For complements, a decrease in the price of one will not only increase its quantity demanded, it will also increase the demand for the other good. For example, lower prices for DVD players over the past decade have substantially increased the demand for movies on DVD. The reverse is also true. As a complement becomes more expensive, the quantity demanded of it will fall, and so will the demand for its complements. For example, if the price of steak rises, grocery stores can expect to sell fewer bottles of steak sauce, even if the price of steak sauce remains unchanged.

Complements

Products that are usually consumed jointly (for example, bread and butter, hot dogs and hot dog buns). A decrease in the price of one will cause an increase in demand for the other.

4. CHANGES IN EXPECTATIONS. Consumers’ expectations about the future also can affect the current demand for a product. If consumers begin to expect that a major hurricane will strike their area, the current demand for batteries and canned food will rise. Expectations about the future direction of the economy can also affect current demand. If consumers are pessimistic about the economy, they start spending less, causing the current demand for goods to fall. Perhaps most important is how a change in the expected



THUMBNAIL SKETCH

Factors That Cause Changes in Demand and Quantity Demanded

This factor changes the quantity demanded of a good:

1. The price of the good: A higher price decreases the quantity demanded; a lower price increases the quantity demanded.

These factors change the demand for a good:

1. Consumer income: Lower consumer income decreases demand; higher consumer income increases demand.
2. Number of consumers in the market: Fewer consumers decreases demand; more consumers increases demand.
- 3a. Price of a substitute good: A decrease in the price of a substitute decreases the demand for the original good; an increase in the price of a substitute increases the demand for the original good.
- 3b. Price of a complementary good: An increase in the price of a complement decreases the demand for the original good; a decrease in the price of a complement increases the demand for the original good.
4. Expected future price of the good: If the price of a good is expected to fall in the future, the current demand for it will decrease; if the price of a good is expected to rise in the future, the current demand for it will increase.
5. Demographic changes: Population trends in age, gender, race, and other factors can increase or decrease demand for specific goods.
6. Consumer preferences: Changes in consumer tastes and preferences can increase or decrease demand for specific goods.

future price of a good affects current demand. When consumers expect the price of a product to rise in the future, their current demand for it will increase. Gasoline is a good example. If you expect the price to increase soon, you'll want to fill up your tank now before the price goes up. In contrast, consumers will delay a purchase if they expect the item to decrease in price. No doubt you have heard someone say, "I'll wait until it goes on sale." When consumers expect the price of a product to fall, current demand for it will decline.

5. DEMOGRAPHIC CHANGES. The demand for many products is strongly influenced by the demographic composition of the market. An increase in the elderly population in the United States in recent years has increased the demand for medical care, retirement housing, and vacation travel. The demand curves for these goods have shifted to the right. During the 1980s, the number of people aged 15–24 fell by more than 5 million. Because young people are a major part of the U.S. market for jeans, the demand for jeans fell by more than 100 million pairs over the course of the decade.⁵ More recently, the increased use of cell phones and iPods among teenagers has led to a reduction in the demand for wristwatches.

6. CHANGES IN CONSUMER TASTES AND PREFERENCES. Why do preferences change? Preferences change because people change and because people acquire new information. Consider how consumers are responding to the popularity of the Atkins diet. The demand for high-carbohydrate foods like white bread has fallen substantially, whereas the demand for low-carbohydrate foods like beef has risen. This is a major change from the 1990s, when the demand for beef fell because of the "heart-healthy" eating habits consumers preferred then. Trends in the markets for clothing, toys, collectibles, and entertainment are constantly causing changes in the demand for these products as well. Firms may even try to change consumer preferences for their own products through advertising and information brochures.

The accompanying **Thumbnail Sketch** summarizes the major factors that cause a change in *demand*—a shift of the entire demand curve—and points out that quantity *demand* (but not demand) will change in response to a change in the price of a good.

⁵These figures are from Suzanne Tregarthen, "Market for Jeans Shrinks," *The Margin* 6, no. 3 (January–February 1991): 28.

Producer Choice and the Law of Supply

Now let's shift our focus to producers and the supply side of the market. How does the market process determine the amount of each good that will be produced? To figure this out, we first have to understand what influences the choices of producers. Producers convert resources into goods and services by doing the following:

1. organizing productive inputs and resources, like land, labor, capital, natural resources, and intermediate goods;
2. transforming and combining these inputs into goods and services; and
3. selling the final products to consumers.

Producers have to purchase the resources at prices determined by market forces. Predictably, the owners of these resources will supply the resources only at prices at least equal to what they could earn elsewhere. Put another way, each resource the producers buy to make their product has to be bid away from all other potential uses. Its owner has to be paid its opportunity cost. The sum of the producer's cost of each resource used to produce a good will equal the **opportunity cost of production**.

There is an important difference between the opportunity cost of production and standard accounting measures of cost. Accountants generally do not count the cost of the firm's assets, such as its buildings, equipment, and financial resources, when they calculate a product's cost. But economists do. Economists consider the fact that these assets could be used some other way—in other words, that they have an opportunity cost. Unless these opportunity costs are covered, the resources will eventually be used in other ways.

The opportunity cost of these assets to the firm is the amount of money the firm could earn from the assets if they were used another way. Consider a manufacturer that invests \$10 million in buildings and equipment to produce shirts. Instead of buying buildings and equipment, the manufacturer could simply put the \$10 million in the bank and let it draw interest. If the \$10 million were earning, say, 10 percent interest, the firm would make \$1 million on that money in a year's time. This \$1 million in forgone interest is part of the firm's opportunity cost of producing shirts. Unlike an accountant, an economist will take that \$1 million opportunity cost into account. If the firm plans to invest the money in shirt-making equipment, it had better earn more from making the shirts than the \$1 million it could earn by simply putting the money in the bank. If the firm can't generate enough to cover all of its costs, including the opportunity cost of assets owned by the firm, it will not continue in business.

Opportunity cost of production

The total economic cost of producing a good or service. The cost component includes the opportunity cost of all resources, including those owned by the firm. The opportunity cost is equal to the value of the production of other goods sacrificed as the result of producing the good.

The Role of Profits and Losses

PROFITS AND LOSSES



Profits direct producers toward activities that increase the value of resources; losses impose a penalty on those who reduce the value of resources.

Profit

An excess of sales revenue relative to the opportunity cost of production. The cost component includes the opportunity cost of all resources, including those owned by the firm. Therefore, profit accrues only when the value of the good produced is greater than the value of the resources used for its production.

Firms earn a **profit** when the revenues from the goods and services that they supply exceed the opportunity cost of the resources used to make them. Consumers will not buy goods and services unless they value them at least as much as their purchase price. For example, Susan would not be willing to pay \$40 for a pair of jeans unless she valued them by at least that amount. At the same time, the seller's opportunity cost of supplying a good will reflect the value consumers place on *other* goods that could have been produced with those same resources. This is true precisely because the seller has to bid those resources away from other producers wanting to use them.

Think about what it means when, for example, a firm is able to produce jeans at a cost of \$30 per pair and sell them for \$40, thereby reaping a profit of \$10 per pair. The \$30 opportunity cost of the jeans indicates that the resources used to produce the jeans could have been used to produce other items worth \$30 to consumers (perhaps a denim

backpack). In turn, the profit indicates that consumers value the jeans more than other goods that might have been produced with the resources used to supply the jeans.

The willingness of consumers to pay a price greater than a good's opportunity cost indicates that they value the good more than other things that could have been produced with the same resources. Viewed from this perspective, profit is a reward earned by entrepreneurs who use resources to produce goods consumers value more highly than the other goods those resources could have produced. In essence, this profit is a signal that an entrepreneur has increased the value of the resources under his or her control.

Business decision makers will seek to undertake production of goods and services that will generate profit. However, things do not always turn out as expected. Sometimes business firms are unable to cover their costs. **Losses** occur when the revenue derived from sales is insufficient to cover the opportunity cost of the resources used to produce a good or service. Losses indicate that the firm has reduced the value of the resources it has used. In other words, consumers would have been better off if those resources had been used to produce something else. In a market economy, losses will eventually cause firms to go out of business, and the resources they previously utilized will be directed toward other things valued more highly, or to other firms who can produce those same goods at a lower cost.

Profits and losses play a very important role in a market economy. They determine which products (and firms) will expand and survive, and which will contract and be driven from the market. Clearly, there is a positive side to business failures. As our preceding discussion highlights, losses and business failures free up resources being used unwisely so they can be put to use by other firms providing consumers with more value.

Loss

A deficit of sales revenue relative to the opportunity cost of production. Losses are a penalty imposed on those who produce goods even though they are valued less than the resources required for their production.

Supply and the Entrepreneur

Entrepreneurs organize the production of new products. In doing so, they take on significant risk in deciding what to produce and how to produce it. Their success or failure depends on how much consumers eventually value the products they develop relative to other products that could have been produced with the resources. Entrepreneurs figure out which projects are likely to be profitable and then try to persuade a corporation, a banker, or individual investors to invest the resources needed to give their new idea a chance. Studies indicate, however, that only about 55 to 65 percent of the new products introduced are still on the market five years later. Being an entrepreneur means you have to risk failing.

To prosper, entrepreneurs must convert and rearrange resources in a manner that will increase their value. A person who purchases 100 acres of raw land, puts in streets and a sewage-disposal system, divides the plot into 1-acre lots, and sells them for 50 percent more than the opportunity cost of all resources used is clearly an entrepreneur. This entrepreneur profits because the value of the resources has increased. Sometimes entrepreneurial activity is less complex, though. For example, a 15-year-old who purchases a power mower and sells lawn services to his neighbors is also an entrepreneur seeking to profit by increasing the value of his resources—time and equipment.

Market Supply Schedule

How will producer-entrepreneurs respond to a change in product price? Other things constant, a higher price will increase the producer's incentive to supply the good. Established producers will expand the scale of their operations, and over time new entrepreneurs, seeking personal gain, will enter the market and begin supplying the product, too.

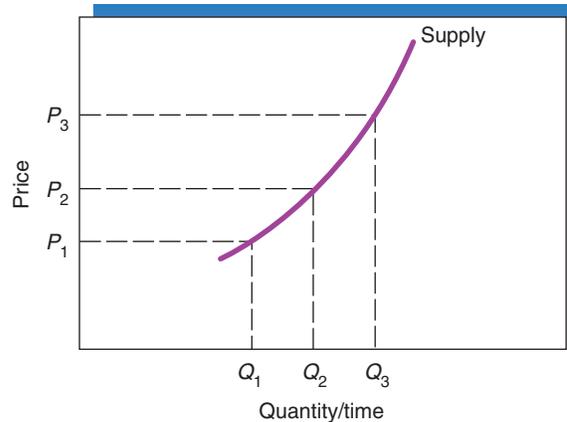


Alex Maclean/Photonic/Getty Images

An entrepreneur who buys raw land, puts in streets and sewer lines, and divides up the land into lots for sale will earn a profit because they have increased the value of the resources under their control.

EXHIBIT 6 Supply Curve

As the price of a product increases, other things constant, producers will increase the amount of the product supplied to the market.



Law of supply

A principle that states there is a direct relationship between the price of a good and the quantity of it producers are willing to supply. As the price of a good increases, producers will wish to supply more of it. As the price decreases, producers will wish to supply less.

The law of supply states that there is a direct (or positive) relationship between the price of a good or service and the amount of it that suppliers are willing to produce. This direct relationship means that price and the quantity producers wish to supply move in the same direction. As the price increases, producers will supply more—and as the price decreases, they will supply less.

Like the law of demand, the law of supply reflects the basic economic principle that incentives matter. Higher prices increase the reward entrepreneurs get from selling their products. The more profitable it is to produce a product, the more of it entrepreneurs will be willing to supply. Conversely, as the price of a product falls, so do its profitability and the incentive to supply it. Just think about how many hours of tutoring services you would be willing to supply for different prices. Would you be willing to spend more time tutoring students if instead of \$8 per hour, tutoring paid \$50 per hour? The law of supply suggests you would, and producers of other goods and services are no different.

EXHIBIT 6 illustrates the law of supply. The curve shown in the exhibit is called a *supply curve*. Because there is a direct relationship between a good's price and the amount offered for sale by suppliers, the supply curve has a positive slope. It slopes upward to the right. Read horizontally, the supply curve shows how much of a particular good producers are willing to produce and sell at a given price. Read vertically, the supply curve reveals important information about the cost of production. The height of the supply curve indicates both (1) the minimum price necessary to induce producers to supply that additional unit and (2) the opportunity cost of producing that additional unit. These are both measured by the height of the supply curve because the minimum price required to induce a supplier to sell a unit is precisely the marginal cost of producing it.

Producer Surplus

We previously used the demand curve to illustrate consumer surplus, the net gains of buyers from market exchanges. The supply curve can be used in a similar manner to illustrate the net gains of producers and resource suppliers. Suppose that you are an aspiring musician and are willing to perform a two-hour concert for \$500. If a promoter offers to pay you \$750 to perform the concert, you will accept, and receive \$250 more than your minimum price. This \$250 net gain represents your **producer surplus**. In effect, producer surplus is the difference between the amount a supplier actually receives (based on the market price) and the minimum price required to induce the supplier to produce the given units (their marginal cost). The measurement of producer surplus for an entire market is illustrated by the shaded area of **EXHIBIT 7**.

It's important to note that producer surplus represents the gains received by all parties contributing resources to the production of a good. In this respect, producer surplus is fundamentally different from profit. Profit accrues to the owners of the business firm producing the good, whereas producer surplus encompasses the net gains derived by all people who help produce the good, including those employed by or selling resources to the firm.

Producer surplus

The difference between the price suppliers actually receive and the minimum price they would be willing to accept. It measures the net gains to producers and resource suppliers from market exchange. It is not the same as profit.

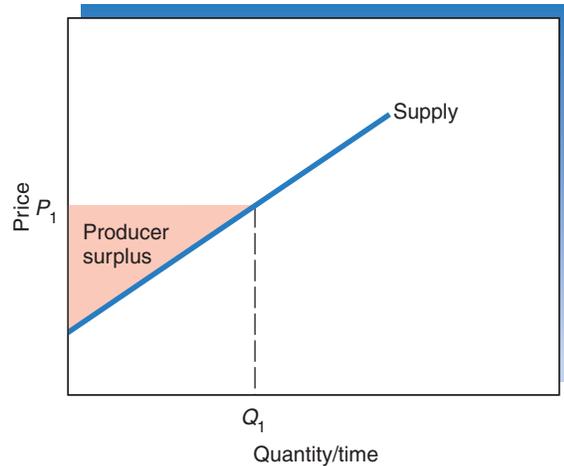


EXHIBIT 7 Producer Surplus

Producer surplus is the area above the supply curve but below the actual sales price. This area represents the net gains to producers and resource suppliers from production and exchange.

Responsiveness of Quantity Supplied to Price Changes: Elastic and Inelastic Supply Curves

Like the quantity demanded, the responsiveness of the quantity supplied to a change in price is different for different goods. The supply curve is said to be elastic when a modest change in price leads to a large change in quantity supplied. This is generally true when the additional resources needed to expand output can be obtained with only a small increase in their price. Consider the supply of soft drinks. The contents of soft drinks—primarily carbonated water, sugar, and flavoring—are abundantly available. A sharp increase in the use of these ingredients by soft drink producers is unlikely to push up their price much. Therefore, as **EXHIBIT 8** illustrates, if the price of soft drinks were to rise from \$1 to \$1.50, producers would be willing to expand output sharply from 100 million to 200 million cans per month. A 50 percent increase in price leads to a 100 percent expansion in quantity supplied. The larger the increase in quantity in response to a higher price, the more elastic the supply curve. The flatness of the supply curve for soft drinks reflects the fact that it is highly elastic.

In contrast, when the quantity supplied is not very responsive to a change in price, supply is said to be inelastic. Physicians' services are an example. If the earnings of doctors increase from \$100 to \$150 per hour, there will be some increase in the quantity of the services they provide. Some physicians will work longer hours; others may delay

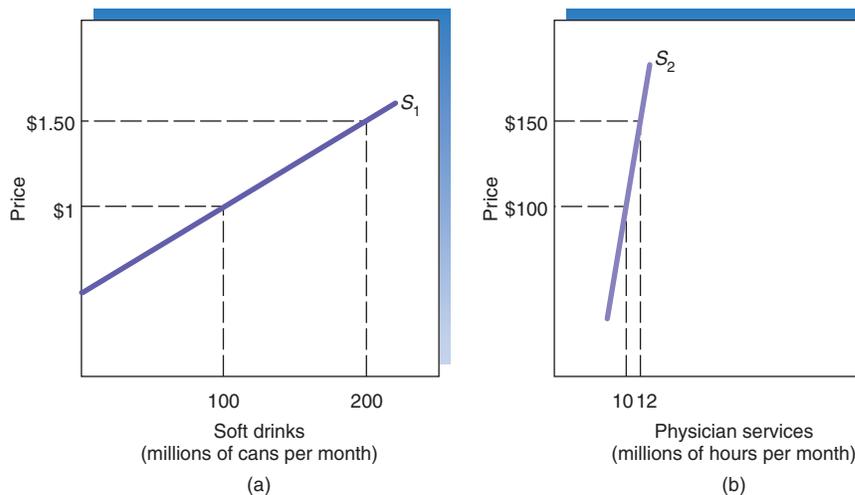


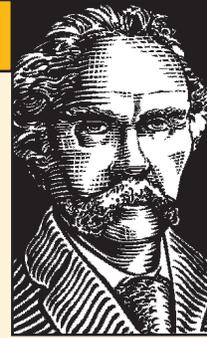
EXHIBIT 8 Elastic and Inelastic Supply Curves

Frame (a) illustrates a supply curve that is relatively elastic and therefore the quantity supplied is highly responsive to a change in price. Soft drinks provide an example. Frame (b) illustrates a relatively inelastic supply curve, one in which the quantity supplied increases by only a small amount in response to a change in price. This is the case for physician services.

OUTSTANDING ECONOMIST

Alfred Marshall (1842–1924)

British economist Alfred Marshall was one of the most influential economists of his era. Many concepts and tools that form the core of modern microeconomics originated with Marshall in his famous *Principles of Economics*, first published in 1890. Marshall introduced the concepts of supply and demand, equilibrium, elasticity, consumers' and producers' surplus, and the idea of distinguishing between short-run and long-run changes.



retirement. Yet, these adjustments are likely to result in only a small increase in the quantity supplied because it takes a long time to train a physician and the number of qualified doctors who are working in other occupations or who are outside of the labor force is small. Therefore, as Exhibit 8 (right frame) shows, a 50 percent increase in the price of physician services leads to only a 20 percent expansion in the quantity supplied. Unlike soft drinks, higher prices for physician services do not generate much increase in quantity supplied. Economists would say that the supply of physician services is relatively inelastic.

Changes in Supply versus Changes in Quantity Supplied

Like demand, it is important to distinguish between a change in the *quantity supplied* and a change in *supply*. When producers change the number of units they are willing to supply in response to a change in price, this movement along the supply curve is called a “change in *quantity supplied*.” A change in any factor *other than the price* shifts the supply curve and is called a “change in *supply*.”

As we previously discussed, profit-seeking entrepreneurs will produce a good only if its sales price is expected to exceed its opportunity cost of production. Therefore, changes that affect the opportunity cost of supplying a good will also influence the amount of it producers are willing to supply. These other factors, such as the prices of resources used to make the good and the level of technology available, are held constant when we draw the supply curve. The supply curve itself reflects quantity changes only in response to price changes. Changes in these other factors shift the supply curve. Factors that increase the opportunity cost of providing a good will discourage production and decrease supply, shifting the entire curve inward to the left. Conversely, changes that lower the opportunity cost of producers will encourage production and increase supply, shifting the entire curve outward to the right.

Let us now take a closer look at the primary factors that will cause a change in supply and shift the entire curve right or left.

1. CHANGES IN RESOURCE PRICES. How will an increase in the price of a resource, such as wages of workers or the materials used to produce a product, affect the supply of a good? Higher resource prices will increase the cost of production, reducing the profitability of firms supplying the good. The higher cost will induce firms to reduce their output. With time, some may even be driven out of business. As **EXHIBIT 9** illustrates, higher resource prices will reduce the supply of the good, causing a shift to the left in the supply curve from S_1 to S_2 . Alternatively, a reduction in the price of a resource used to produce a good will cause an increase in supply—a rightward shift in the supply curve—as firms expand output in response to the lower costs and increased profitability of supplying the good.

2. CHANGES IN TECHNOLOGY. Like lower resource prices, technological improvements—the discovery of new, lower-cost production techniques—reduce production costs, and

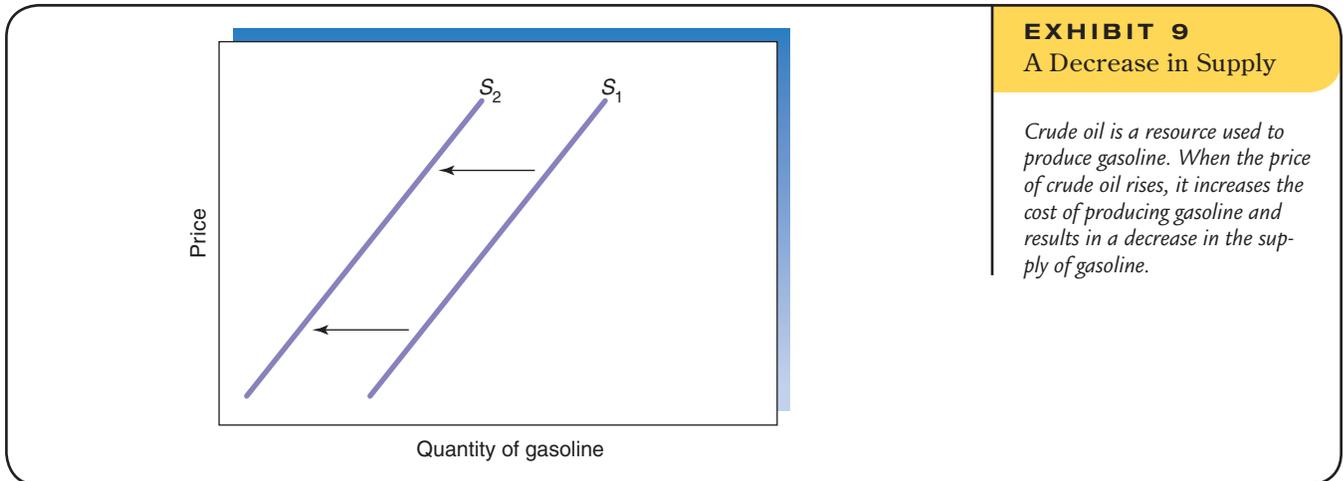


EXHIBIT 9 A Decrease in Supply

Crude oil is a resource used to produce gasoline. When the price of crude oil rises, it increases the cost of producing gasoline and results in a decrease in the supply of gasoline.

thereby increase supply. Technological advances have affected the cost of almost everything. Before the invention of the printing press, books had to be handwritten. Just imagine the massive reduction in cost and increase in the supply of books caused by this single invention. Similarly, improved farm machinery has vastly expanded the supply of agricultural products through the years. Robotics have reduced the cost of producing airplanes, automobiles, and other types of machinery. Better computer chips have drastically reduced the cost of producing electronics. Less than forty years ago, a simple calculator cost more than \$100, a microwave oven almost \$500, and a VCR approximately \$1,000. When introduced in the mid-1980s, a cellular telephone cost more than \$4,000. You have probably noticed that the prices of flat-screen computer monitors and plasma-screen televisions have fallen substantially in recent years. Again, technological advances explain the changes.

3. ELEMENTS OF NATURE AND POLITICAL DISRUPTIONS. Natural disasters and changing political conditions can also alter supply, sometimes dramatically. In some years, good weather leads to “bumper crops,” increasing the supply of agricultural products. At other times, freezes or droughts lead to poor harvests, reducing supply. War and political unrest in the Middle East region have had a major impact on the supply of oil several times during the past few decades. Factors such as these will alter supply.

4. CHANGES IN TAXES. If the government increases the taxes on the sellers of a product, the result will be the same as any other increase in the cost of doing business. The added tax that sellers have to pay will reduce their willingness to sell the product at any given

THUMBNAIL SKETCH

Factors That Cause Changes in Supply and Quantity Supplied

This factor changes the quantity supplied of a good:

1. The price of the good: A lower price decreases the quantity supplied; a higher price increases the quantity supplied.

These factors change the supply of a good:

1. Resource prices (the prices of things used to make the good): Lower resource prices increase supply; higher resource prices decrease supply.

2. Technological change: A technological improvement increases supply; a technological setback decreases supply.
3. Weather or political conditions: Favorable weather or good political conditions increase supply; adverse weather conditions or poor political conditions decrease supply.
4. Taxes imposed on the producers of a good: Lower taxes increase supply; higher taxes decrease supply.

price. Each unit must now be sold for a price that covers not only the opportunity cost of production, but also the tax. For example, the Superfund law placed a special tax on petroleum producers based on their output. That raised the cost of producing petroleum products, decreasing the amount producers were willing to supply.

The accompanying **Thumbnail Sketch** summarizes the major factors that change *supply*—a shift of the entire supply curve; and quantity supplied—a movement along the supply curve.

How Market Prices Are Determined: Supply and Demand Interact

Consumer–buyers and producer–sellers make decisions independent of each other, but market prices coordinate their choices and influence their actions. To the economist, a **market** is not a physical location but an abstract concept that encompasses the forces generated by the decisions of buyers and sellers. A market may be quite narrow (for example, the market for grade A jumbo eggs), or it may be quite broad like when we lump diverse goods into a single market, such as the market for all “consumer goods.” There is also a wide range of sophistication among markets. The New York Stock Exchange is a highly formal, computerized market. Each weekday, buyers and sellers, who seldom meet, electronically exchange corporate shares they own worth billions of dollars. In contrast, a neighborhood market for babysitting services or tutoring in economics may be highly informal, bringing together buyers and sellers primarily by word of mouth.

Equilibrium is a state in which the conflicting forces of supply and demand are in balance. When a market is in equilibrium, the decisions of consumers and producers are brought into harmony with one another, and the quantity supplied will equal the quantity demanded. In equilibrium, it is possible for both buyers and sellers to realize their choices simultaneously. What could bring these diverse interests into harmony? We will see that the answer is market prices.

Market Equilibrium

As we have learned, a higher price will reduce the quantity of a good demanded by consumers. Conversely, a higher price will increase the quantity of a good supplied by producers. The market price of a good will tend to change in a direction that will bring the quantity of a good consumers want to buy into balance with the quantity producers want to sell. If the price is too high, the quantity supplied by producers will exceed the quantity demanded. They will be unable to sell as much as they would like unless they reduce their price. Alternatively, if the price is too low, the quantity demanded by consumers will exceed the quantity supplied. Some consumers will be unable to get as much as they would like, unless they are willing to pay a higher price to bid some of the good away from other potential customers. Thus, there will be a tendency for the price in a market to move toward the price that brings the two into balance.

People have a tendency to think of consumers wanting lower prices and producers wanting higher prices. Although this is true, price changes frequently trend toward the middle of the two extremes. When a local store has an excess supply of a particular item, how does it get rid of it? By having a sale or somehow otherwise lowering its price (a “blue-light special”). Firms often lower their prices in order to get rid of excess supply.

In contrast, excess demand is solved by consumers bidding up prices. Children’s toys around Christmas provide a perfect example. When first introduced, items such as the Nintendo Wii, Webkinz, and the Tickle-Me-Elmo doll were immediate successes. The firms producing these products had not anticipated the overwhelming demand; every child wanted one for Christmas. Some stores raised their prices, but the demand was so strong that lines of parents were forming outside stores before they even opened. Often, only the first few in line were able to get the toys (a sure sign that the store had set the price below equilibrium). Out in the parking

Market

An abstract concept encompassing the forces of supply and demand, and the interaction of buyers and sellers with the potential for exchange to occur.

Equilibrium

A state in which the conflicting forces of supply and demand are in balance. When a market is in equilibrium, the decisions of consumers and producers are brought into harmony with one another, and the quantity supplied will equal the quantity demanded.

lots, in the classified ads, and on eBay, parents were offering to pay even higher prices for these items. If stores were not going to set the prices right, parents in these informal markets would! These examples show that rising prices are often the result of consumers bidding up prices when excess demand is present. A similar phenomenon can be seen in the market for tickets to a World Series game or a popular music group’s upcoming concert, as the immediate value of a ticket on the resale market can be much higher than the original retail price if, at that price, the original quantity supplied is not adequate to meet the quantity demanded.

As these examples illustrate, whenever quantity supplied and quantity demanded are not in balance, there is a tendency for price to change in a manner that will correct the imbalance. It is possible to show this process graphically with the supply and demand curves we have developed in this chapter. **EXHIBIT 10** shows the supply and demand curves in the market for a basic calculator. At a high price—\$12, for example—producers will plan to supply 600 calculators per day, whereas consumers will choose to purchase only 450. An excess supply of 150 calculators (shown by distance *ab* in the graph) will result. Unsold calculators will push the inventories of producers upward. To get rid of some of their calculators in inventory, some producers will cut their price to increase their sales. Other firms will have to lower their price, too, as a result, or sell even fewer calculators. This lower price will make supplying calculators less attractive to producers. Some of them will go out of business. Others will reduce their output or perhaps produce other products. How low will the price of calculators go? As the figure shows, when the price has declined to \$10, the quantity supplied by producers and the quantity demanded by consumers will be in balance at 550 calculators per day. At this price (\$10), the quantity demanded by consumers just equals the quantity supplied by producers, and the choices of the two groups are brought into harmony.

What will happen if the price per calculator is lower—\$8, for example? In this case, the amount demanded by consumers (650 units) will exceed the amount supplied by producers (500 units). An excess demand of 150 units (shown by the distance *cd* in the graph) will be the result. Some consumers who are unable to purchase the calculators at \$8 per

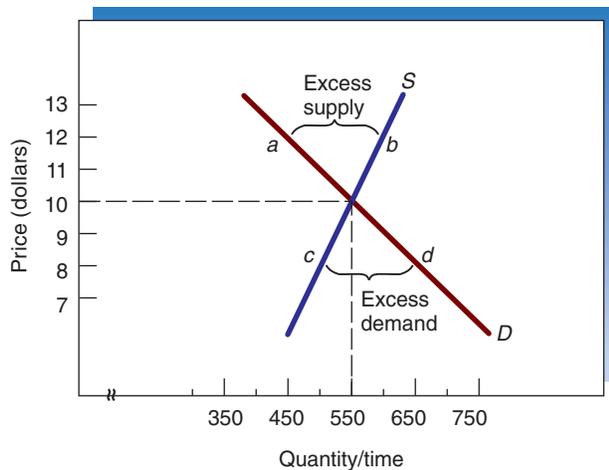


EXHIBIT 10
Supply and Demand

The table indicates the supply and demand conditions for calculators. These conditions are also illustrated by the graph. When the price exceeds \$10, an excess supply is present, which places downward pressure on price. In contrast, when the price is less than \$10, an excess demand results, which causes the price to rise. Thus, the market price will tend toward \$10, at which point the quantity demanded will be equal to the quantity supplied.

PRICE OF CALCULATORS (DOLLARS)	QUANTITY SUPPLIED (PER DAY)	QUANTITY DEMANDED (PER DAY)	CONDITION IN THE MARKET	DIRECTION OF PRESSURE ON PRICE
\$13	625	400	Excess supply	Downward
12	600	450	Excess supply	Downward
11	575	500	Excess supply	Downward
10	550	550	Balance	Equilibrium
9	525	600	Excess demand	Upward
8	500	650	Excess demand	Upward
7	475	700	Excess demand	Upward

unit because of the inadequate supply would be willing to pay a higher price. Recognizing this fact, producers will raise their price. As the price increases to \$10, producers will expand their output and consumers will cut down on their consumption. At the \$10 price, equilibrium will be restored.

Efficiency and Market Equilibrium

Economic efficiency

A situation in which all of the potential gains from trade have been realized. An action is efficient only if it creates more benefit than cost. With well-defined property rights and competition, market equilibrium is efficient.

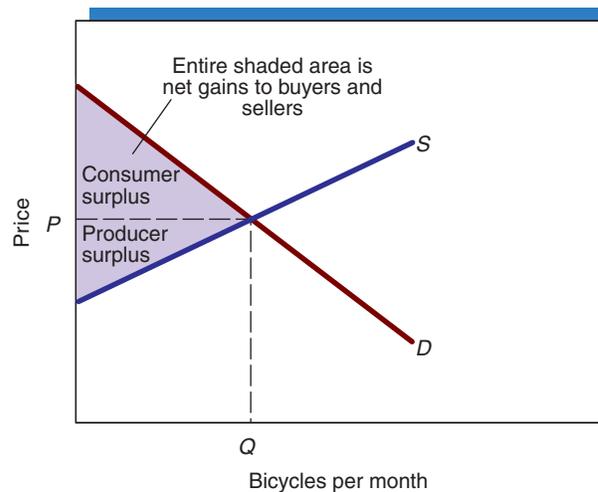
When a market reaches equilibrium, all the gains from trade have been fully realized and **economic efficiency** is present. Economists often use economic efficiency as a standard to measure outcomes under alternative circumstances. The central idea of efficiency is a cost-versus-benefit comparison. On the one hand, undertaking an economic action will be efficient only if it generates more benefit than cost. On the other hand, undertaking an action that generates more cost than benefit is inefficient. For a market to be efficient, all trades that generate more benefit than cost need to be undertaken. In addition, economic efficiency requires that no trades creating more cost than benefit be undertaken.

A closer look at the way in which markets work can help us understand the concept of efficiency. The supply curve reflects producers' opportunity cost. Each point along the supply curve indicates the minimum price for which the units of a good could be produced without a loss to the seller. Assuming no other third parties are affected by the production of this good, then the height of the supply curve represents the opportunity cost to society of producing and selling the good. On the other side of the market, each point along the demand curve indicates how consumers value an extra unit of the good—that is, the maximum amount the consumer is willing to pay for the extra unit. Again assuming that no other third parties are affected, the height of the demand curve represents the benefit to society of producing and selling the good. Any time the consumer's valuation of a unit (the benefit) exceeds the producer's minimum supply price (the cost), producing and selling the unit is consistent with economic efficiency. The trade will result in mutual gain to both parties. When property rights are well defined and only the buyers and sellers are affected by production and exchange, competitive market forces will automatically guide a market toward an equilibrium level of output that satisfies economic efficiency.

EXHIBIT 11 illustrates why this is true. Suppliers of bicycles will produce additional bicycles as long as the market price exceeds their opportunity cost of production (shown by the height of the supply curve). Similarly, consumers will continue to purchase additional bikes as long as their benefit (shown by the height of the demand curve) exceeds the market price. Eventually, market forces will result in an equilibrium output level of Q and a price of P . At this point, all the bicycles providing benefits to consumers that exceed the costs to suppliers will be produced. Economic efficiency is met because all of the potential

EXHIBIT 11 Economic Efficiency

When markets are competitive and property rights are well defined, the equilibrium reached by a market satisfies economic efficiency. All units that create more benefit (the buyer's valuation shown by the height of the demand curve) than cost (opportunity cost of production shown by the height of the supply curve) are produced. This maximizes the total gains from trade, the combined area represented by consumer and producer surplus.



ECONOMICS *at The Movies*

Pretty Woman (1990)

In *Pretty Woman*, Julia Roberts agrees to spend the week as Richard Gere's companion for \$3,000. After Roberts and Gere agree on the price, she tells him that she would have been willing to do it for \$2,000. His reply is that he would have been willing to pay \$4,000. With this additional information, we know that the exchange netted Roberts' character \$1,000 in producer surplus and Gere's character \$1,000 in consumer surplus. This scene illustrates mutual gains from trade.



Touchstone/Warner's/The Kobal Collection

consumer and producer gains from exchange (shown by the shaded area) have occurred. As you can see, the point of market equilibrium is also the point where the combined area showing consumer and producer surplus is the greatest.

When fewer than Q bicycles are produced, some bicycles valued more by consumers than the opportunity cost of producing them are not being produced. This is not consistent with economic efficiency. On the other hand, if output is expanded beyond Q , inefficiency will also result because some of the bicycles cost more to produce than consumers are willing to pay for them. Prices in competitive markets eventually guide producers and consumers to the level of output consistent with economic efficiency.

How Markets Respond to Changes in Demand and Supply

How will a market adjust to a change in demand? **EXHIBIT 12** shows the market adjustment to an increase in the demand for eggs around Easter. Demand D_1 and supply S are typical throughout much of the year. During the two weeks before Easter, however, consumer demand for eggs rises because people purchase them to decorate, too. This shifts egg demand from D_1 to D_2 during that time of year. As you can see, the increase in demand pushes the price upward from P_1 to P_2 (typically by about 20 cents per dozen), and results in a larger equilibrium quantity traded (Q_2 rather than Q_1 —an increase of typically around 600 million eggs). There is a new equilibrium at point b around Easter (versus point a during the rest of the year).

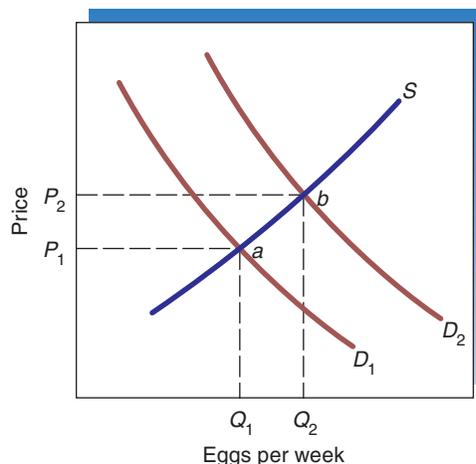


EXHIBIT 12 Market Adjustment to Increase in Demand

Here, we illustrate how the market for eggs adjusts to an increase in demand such as generally occurs around Easter. Initially (before the Easter season), the market for eggs reflects demand D_1 and supply S . The increase in demand (shift from D_1 to D_2) pushes price up and leads to a new equilibrium at a higher price (P_2 rather than P_1) and larger quantity traded (Q_2).

APPLICATIONS IN ECONOMICS

Supply, Demand, and the Price of a Bride

The Chinese family planning policy initiated in 1979 has increased the supply of males and reduced the supply of females. Among the Chinese population under age 20, there were 32 million more males than females in 2005. By way of comparison, 32 million is roughly the population of Canada. Customarily, in China the groom's family pays the bride's family a set amount—known as cai li—while the bride furnishes a dowry of mostly simple household items. In the 1980s, when there was more balance between men and women in the youthful population, the cai li payments were small, something like a couple of sets of clothes.

In the 1990s, cai li prices rose to several thousand yuan (about \$200 to \$400). There is now a huge supply of men relative to women among the Chinese population approaching the typical age of marriage. This has generated a strong demand for brides, causing cai li prices to spike upward to the 6,000 to 10,000 yuan range. The soaring prices for brides is even affecting the saving rate in areas with the largest excess supply of youthful men, as families save more in order to be in a position to pay the high cai li prices. Supply, demand, and prices affect behavior even for something as sacred as marriage.

Source: Mei Fong, "It's Cold Cash, Not Cold Feet, Motivating Runaway Brides in China," *Wall Street Journal*, June 5, 2009.

The tradition of coloring and hunting for eggs causes an increase in demand for eggs around Easter. As Exhibit 12 illustrates, this leads to higher egg prices and costly actions by producers to supply a larger quantity during this period.



Hub-Wilh, 2009/Used under license from Shutterstock.com

Although consumers may not be happy about paying a higher price for eggs around Easter, the higher price serves two essential purposes. First, it encourages consumers to conserve on their usage of eggs. Some consumers may purchase only two dozen eggs to color, rather than three; other consumers may skip having an omelet for breakfast and have yogurt instead. These steps on the consumer side of the market help make the eggs that are available around Easter go farther. Second, the higher price is precisely what results in the additional 600 million eggs being supplied to the market to satisfy this increased consumer demand. Without the price increase, excess demand would be present, and many consumers would simply be unable to find eggs to purchase around Easter. If the price remained at P_1 (the equilibrium price throughout most of the year), consumers at Easter time would want to purchase more eggs than producers would be willing to supply. At the higher P_2 price, however, the quantity suppliers are willing to sell is again in balance with the quantity consumers wish to purchase.

Why were suppliers unwilling to supply the additional 600 million eggs at the original price of P_1 ? Because at the original equilibrium price of P_1 , suppliers were already producing and selling all the eggs that cost less to produce than that price. The additional eggs desired by consumers around Easter all cost more to produce than the old market price

of P_1 . The higher price of P_2 is what allows suppliers to cover their higher production costs associated with these extra eggs. Around Easter, farmers take costly steps to avoid having the hens molt because hens lay fewer eggs when they are molting. They do this by changing the quantity and types of feed and by increasing the lighting in the birds' sheds—both of which mean higher production costs. Farmers also try to build up larger than normal inventories of eggs before Easter. Eggs are typically about two days old when consumers buy them at the store, but can be up to seven days old around Easter time. Building up and maintaining this additional inventory are costly, too.

In a market economy, when the demand for a good increases, its price will rise, which will (1) motivate consumers to search for substitutes and cut back on additional purchases of the good and (2) motivate producers to supply more of the good. These two forces will eventually bring the quantity demanded and quantity supplied back into balance.

It's important to note that this response on the supply side of the egg market is not a shift in the supply curve. The supply curve remains unchanged. Rather, there is a movement along the original supply curve—a change in *quantity* supplied. The only reason suppliers are willing to alter their behavior (produce more eggs) is because the increased demand has pushed up the price of eggs. Notice that it is the change in demand (a shift of the demand curve) that leads to the change in quantity supplied (a movement along the supply curve). Producers are simply responding to the price movement caused by the change in demand. A movement along one curve (a change in quantity supplied *or* a change in quantity demanded) happens in response to a shift in the other curve (a change in demand or a change in supply).

When the demand for a product declines, the adjustment process sends buyers and sellers just the opposite signals. Take a piece of paper and see if you can diagram a decrease in demand and how it will affect price and quantity in a market. If you've done it correctly, a decline in demand (a shift to the left in the demand curve) will lead to a lower price and a lower quantity traded. What's going on in the diagram is that the lower price (caused by lower consumer demand) is reducing the incentive of producers to supply the good. When consumers no longer want as much of a good, falling market prices signal producers to cut back production. The reduced output allows these resources to be freed up to go into the production of other goods consumers want more.

How will markets respond to changes in supply? **EXHIBIT 13** shows the market's adjustment to a decrease in the supply of lemons, such as happened during January 2007 when freezing temperatures in California destroyed a large portion of the lemon crop. A reduction in supply (shift from S_1 to S_2) will cause the price of lemons to increase sharply (P_1 to P_2). Because of the higher price, consumers will cut back on their consumption of lemons (the movement along the demand curve from a to b). Some will switch to substitutes—in this case, probably other varieties of citrus. The higher price also encourages the remaining

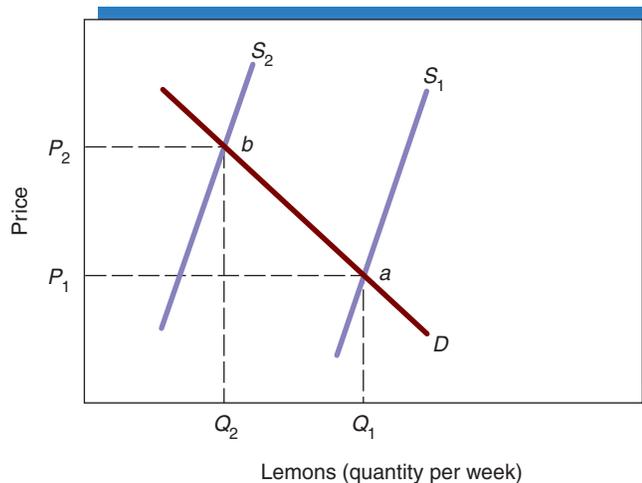


EXHIBIT 13 Market Adjustment to a Decrease in Supply

Here, using lemons as an example, we illustrate how a market adjusts to a decrease in supply. Assume adverse weather conditions substantially reduce the supply (shift from S_1 to S_2) of lemons. The reduction in supply leads to an increase in the equilibrium price (from P_1 to P_2) and a reduction in the equilibrium quantity traded (from Q_1 to Q_2).

THUMBNAIL SKETCH

How Changes in Demand and Supply Affect Market Price and Quantity

Changes in Demand

1. An increase in demand—shown by a rightward shift of the demand curve—will cause an increase in both the equilibrium price and quantity.
2. A decrease in demand—shown by a leftward shift of the demand curve—will cause a decrease in both the equilibrium price and quantity.

Changes in Supply

1. An increase in supply—shown by a rightward shift of the supply curve—will cause a decrease in the equilibrium price and an increase in the equilibrium quantity.
2. A decrease in supply—shown by a leftward shift of the supply curve—will cause an increase in the equilibrium price and a decrease in the equilibrium quantity.

lemon suppliers to take additional steps—like more careful harvesting techniques or using more fertilizer—that allow them to produce more lemons than otherwise would be the case. The higher prices will rebalance the quantity demanded and quantity supplied.

As the lemon example illustrates, a decrease in supply will lead to higher prices and a lower equilibrium quantity. How do you think the market price and quantity would adjust to an increase in supply, as might be caused by a breakthrough in the technology used to harvest the lemons? Again, try to draw the appropriate supply and demand curves to illustrate this case. If you do it correctly, the graph you draw will show an increase in supply (a shift to the right in the supply curve) leading to a lower market price and a larger equilibrium quantity.

The accompanying **Thumbnail Sketch** summarizes the effect of changes—both increases and decreases—in demand and supply on the equilibrium price and quantity. The cases listed in the thumbnail sketch, however, are for when only a single curve shifts. But sometimes market conditions simultaneously shift both demand and supply. For example, consumer income might increase at the same time that a technological advance in production occurs. These two changes will cause both demand and supply to increase at the same time—both curves will shift to the right. The new equilibrium will definitely be at a larger quantity, but the direction of the change in price is indeterminate. The price may either increase or decrease, depending on whether the increase in demand or increase in supply is larger—which curve shifted the most, in other words.

What will happen if supply increases but demand falls at the same time? Price will definitely fall, but the new equilibrium quantity may either increase or decrease. Draw the supply and demand curves for this case and make sure that you understand why.

Invisible Hand Principle

INVISIBLE HAND PRINCIPLE



Market prices coordinate the actions of self-interested individuals and direct them toward activities that promote the general welfare.

More than 230 years ago, Adam Smith, the father of economics, stressed that personal self-interest *when directed by market prices* is a powerful force promoting economic progress. In a famous passage in his book *An Inquiry into the Nature and Causes of the Wealth of Nations*, Smith put it this way:

Every individual is continually exerting himself to find out the most advantageous employment for whatever [income] he can command. It is his own advantage, indeed, and not that of the society which he has in view. But the

study of his own advantage naturally, or rather necessarily, leads him to prefer that employment which is most advantageous to society. . . . He intends only his own gain, and he is in this, as in many other cases, led by an invisible hand to promote an end which was not part of his intention. By pursuing his own interest he frequently promotes that of the society more effectually than when he really intends to promote it.⁷

Smith's fundamental insight was that market forces would tend to align the actions of self-interested individuals with the best interests of society. The tendency of market forces to channel the actions of self-interested individuals into activities that promote the general betterment of society is now known as the **invisible hand principle**. Let's take a closer look at this important principle.

Prices and Market Order

The invisible hand principle can be difficult to grasp because there is a natural tendency to associate order with central direction and control. Surely some central authority must be in charge. But this is not the case. The pricing system, reflecting the choices of literally millions of consumers, producers, and resource owners, provides the direction. The market process works so automatically that most of us give little thought to it. We simply take it for granted.

Perhaps one example from your everyday life will help you better understand the invisible hand principle. Visualize a busy retail store with ten checkout lanes. No individual assigns shoppers to checkout lanes. Shoppers are left to choose for themselves. Nonetheless, they do not all try to get in the same lane. Why? Individuals are always alert for adjustment opportunities that offer personal gain. When one lane gets long or is held up by a price check, some shoppers will shift to other lanes and thereby smooth out the flow among the lanes. Even though central planning is absent, this process of mutual adjustment by self-interested individuals results in order and social cooperation. In fact, the degree of social cooperation is generally well beyond what could be achieved if central coordination were attempted—if, for example, stores hired someone to assign shoppers to checkout lanes in the interest of getting everyone out as quickly as possible. Shoppers *acting in their own interests* promote the most orderly and quickest flow for everyone. A similar phenomenon occurs on busy interstate highways as drivers switch between lanes for personal gain, with the end result being the quickest flow of traffic for everyone and for the group as a whole.

Market participation is a lot like checking out at a retail store or driving on the freeway. Like the number of people in a lane, profits and losses provide market participants with information about the advantages and disadvantages of different economic activities. Losses indicate that an economic activity is congested, and, as a result, producers are unable to cover their costs. In such a case, successful market participants will shift their resources away from such activities toward other, more valuable uses. Conversely, profits are indicative of an open lane, the opportunity to experience gain if one shifts into an activity in which the price is high relative to the per-unit cost. As producers and resource suppliers shift away from activities characterized by congestion and into those characterized by the opportunity for profit, they smooth out economic activity and enhance its flow. Remarkably, even though individuals are motivated by self-interest, market prices direct their actions toward activities that promote both order and economic progress. This is precisely the message of Smith's "invisible hand."

Is the concept of the invisible hand really valid? Next time you sit down to have a nice dinner, think about all the people who help make it possible. It is unlikely that any of them, from the farmer to the truck driver to the grocer, was motivated by a concern that you have

What's the single most important thing to learn from an economics course today? What I tried to leave my students with is the view that the invisible hand is more powerful than the hidden hand. Things will happen in well-organized efforts without direction, controls, or plans. That's the consensus among economists.

—Lawrence Summers,⁶
Economist and former
Secretary of the Treasury

Invisible hand principle

The tendency of market prices to direct individuals pursuing their own interests to engage in activities promoting the economic well-being of society.

⁶Quoted in Daniel Yergin and Joseph Stanislaw, *The Commanding Heights: The Battle between Government and the Marketplace That Is Remaking the Modern World* (New York: Simon and Schuster, 1998), 150.

⁷Adam Smith, *An Inquiry into the Nature and Causes of the Wealth of Nations* (New York: Modern Library, 1937), 423.

an enjoyable meal. Market prices, however, bring their interest into harmony with yours. Farmers who raise the best beef or turkeys receive higher prices; truck drivers and grocers earn more money if their products are delivered fresh and in good condition; and so on. An amazing degree of cooperation and order is created by market exchanges—all without the central direction of any government official.

How do markets bring the interests of individuals into harmony with economic progress? Consider the following three vitally important functions performed by market prices.

1. PRICES COMMUNICATE INFORMATION TO DECISION MAKERS. Suppose a drought in Brazil severely reduces the supply of coffee. Coffee prices will rise. Even if consumers do not know about the drought, the higher prices will provide them with all the information they need to know—it's time to cut back on coffee consumption. *Market prices register information derived from the choices of millions of consumers, producers, and resource suppliers, and provide them with everything they need to know to make wise decisions.*

Market prices provide producers with up-to-date information about which goods consumers most intensely desire, and with important information about the abundance of the resources used in the production process. The cost of production, driven by the opportunity cost of resources, tells the business decision maker the relative importance others place on the alternative uses of those resources. A boom in the housing market might cause lumber prices to rise. In turn, furniture makers seeing these higher lumber prices will utilize substitute raw materials such as metal and plastic in their production processes. Because of market prices, furniture makers will conserve on their use of lumber, just as if they had known that lumber was now more urgently needed for constructing new housing.

2. PRICES COORDINATE THE ACTIONS OF MARKET PARTICIPANTS. Market prices also coordinate the choices of buyers and sellers, bringing their decisions into line with each other. Excess supply will lead to falling prices, which discourage production and encourage consumption until the excess supply is eliminated. Alternatively, excess demand will lead to price increases, which encourage consumers to economize on their uses of the good and suppliers to produce more of it, eliminating the excess demand. Changing market prices induce responses on both sides of the market in the proper direction to help correct these situations.

The combination of product and resource prices will determine profit (and loss) rates for alternative projects and thereby direct entrepreneurs to undertake the production projects that consumers value most intensely (relative to their cost). If consumers really want more of a good—for example, luxury apartments—the intensity of their demand will lead to a market price that exceeds the opportunity cost of constructing the apartments. The profitable opportunity thus created will soon be discovered by entrepreneurs who will undertake the construction, expanding the availability of the apartments. In contrast, if consumers want less of a good, such as large cars, the sales revenue from their production will be less than the opportunity cost of supplying them, penalizing those who undertake such unprofitable production.

3. PRICES MOTIVATE ECONOMIC PLAYERS. Market prices establish a reward–penalty (profit–loss) structure that encourages people to work, cooperate with others, use efficient production methods, supply goods that are intensely desired by others, and invest for the future. Self–interested entrepreneurs will seek to produce only the goods consumers value enough to pay a price sufficient to cover production cost. Self-interest will also encourage producers to use efficient production methods and adopt cost-saving technologies because lower costs will mean greater profits. Firms that fail to do so will be unable to compete successfully in the marketplace.

At the beginning of this chapter, we asked you to reflect on why the grocery stores in your local community generally have on hand about the right amount of milk, bread, vegetables, and other goods. Likewise, how is it that refrigerators, automobiles, and CD

players, produced at different places around the world, make their way to stores near you in approximately the same numbers that they are demanded by consumers? The invisible hand principle provides the answer, and it works without political direction. No government agency needs to tell decision makers to keep costs low or produce those goods most intensely desired by consumers. Similarly, no one has to tell individuals that they should develop skills that are highly valued by others. Once again the profit motive—in this case, higher earnings—will do the job. Many of the things we take for granted in our ordinary lives reflect the invisible hand at work.

Qualifications: Competition and Property Rights

As we noted earlier in this chapter, our focus so far has been on markets in which rival firms can freely enter and exit, and private-property rights are clearly defined and enforced. ***The efficiency of market organization is, in fact, dependent upon these two things: (1) competitive markets and (2) well-defined and enforced private-property rights.***

Competition, the great regulator, can protect both buyer and seller. It protects consumers from sellers who would charge a price substantially above the cost of production or withhold a vital resource for an exorbitant amount of money. Similarly, it protects employees (sellers of their labor) from the power of any single employer (the buyers of labor). Competition equalizes the bargaining power between buyers and sellers.

When property rights are well defined, secure, and tradable, suppliers of goods and services have to pay resource owners for their use. They will not be permitted to seize and use scarce resources without compensating the owners. Neither will they be permitted to use violence (for example, to attack or invade the property of another) to get what they want. The efficiency of markets hinges on the presence of property rights—after all, people can't easily exchange or compete for things they don't have or can't get property rights to. Without well-defined property rights, markets simply cannot function effectively.

Looking ahead

Although we incorporated numerous examples designed to enhance your understanding of the supply-and-demand model throughout this chapter, we have only touched the surface. In various modified forms, this model is the central tool of economics. The following chapter will explore several specific applications and extensions of this important model.



KEY POINTS

- ▼ The law of demand states that there is an inverse (or negative) relationship between the price of a good or service and the quantity of it that consumers are willing to purchase. The height of the demand curve at any quantity shows the maximum price that consumers are willing to pay for that unit.
- ▼ The degree of responsiveness of consumer purchases to a change in price is shown by the steepness of the demand curve. The more responsive buyers are to a change in price, the flatter, or more elastic, the demand curve will be. Conversely, the less responsive buyers are to a change in price, the steeper, or more inelastic, the demand curve will be.
- ▼ A movement along a demand curve is called a change in quantity demanded. A shift of the entire curve is called a change in demand. A change in *quantity demanded* is caused by a change in the price of the good (generally in response to a shift of the supply curve). A change in *demand* can be caused by several things, including a change in consumer income or a change in the price of a closely related good.
- ▼ The opportunity cost of producing a good is equal to the cost of bidding away the resources needed for its production from alternative uses. Profit indicates that the producer has increased the value of the resources

used, whereas a loss indicates that the producer has reduced the value of the resources used.

- ▼ The law of supply states that there is a direct (or positive) relationship between the price of a good or service and the quantity of it that producers are willing to supply. The height of the supply curve at any quantity shows the minimum price necessary to induce suppliers to produce that unit—that is, the opportunity cost of producing it.
- ▼ A movement along a supply curve is called a change in quantity supplied. A change in *quantity supplied* is caused by a change in the price of the good (generally in response to a shift of the demand curve). A shift of the entire supply curve is called a change in supply. A change in *supply* can be caused by several factors, such as a change in resource prices or an improvement in technology.
- ▼ The responsiveness of supply to a change in price is shown by the steepness of the supply curve. The more willing producers are to alter the quantity supplied in response to a change in price, the flatter, or more elastic, the supply curve. Conversely, the less willing producers are to alter the quantity supplied in response to a change in price, the steeper, or less elastic, the supply curve.
- ▼ Prices bring the conflicting forces of supply and demand into balance. There is an automatic tendency for market prices to move toward the equilibrium price, at which the quantity demanded equals the quantity supplied.
- ▼ Consumer surplus represents the net gain to buyers from market trades. Producer surplus represents the net gain to producers and resource suppliers from market trades. In equilibrium, competitive markets maximize these gains, a condition known as economic efficiency.
- ▼ Changes in the prices of goods are caused by changes in supply and demand. An increase in demand will cause the price and quantity supplied to rise. Conversely, a decrease in demand will cause the price and quantity supplied to fall. An increase in supply, however, will cause the price to fall and quantity demanded to rise. Conversely, a decrease in supply will cause the price to rise and quantity demanded to fall.
- ▼ Market prices communicate information, coordinate the actions of buyers and sellers, and motivate decision makers to act. As the invisible hand principle indicates, market prices are generally able to bring the self-interest of individuals into harmony with the general welfare of society. The efficiency of the system is dependent upon two things, however: (1) competitive market conditions and (2) well-defined and secure property rights.



CRITICAL ANALYSIS QUESTIONS

- *1. Which of the following do you think would lead to an increase in the current demand for beef?
 - a. higher pork prices
 - b. higher consumer income
 - c. higher prices of feed grains used to feed cattle
 - d. widespread outbreak of mad cow or hoof-and-mouth disease
 - e. an increase in the price of beef
2. What is being held constant when a demand curve for a specific product (shoes or apples, for example) is constructed? Explain why the demand curve for a product slopes downward to the right.
3. What is the law of supply? How many of the following “goods” do you think conform to the general law of supply? Explain your answer in each case.
 - a. gasoline
 - b. cheating on exams
 - c. political favors from legislators
 - d. the services of heart specialists
 - e. children
 - f. legal divorces
- *4. Are prices an accurate measure of a good’s total value? Are prices an accurate measure of a good’s marginal value? What’s the difference? Can you think of a good that has high total value but low marginal value? Use this concept to explain why professional wrestlers earn more than nurses, despite the fact that nurses probably create more total value to society.
5. What is being held constant when the supply curve is constructed for a specific good like pizza or automobiles? Explain why the supply curve for a good slopes upward to the right.
6. Define consumer and producer surplus. What is meant by economic efficiency, and how does it relate to consumer and producer surplus?
7. Recent tax reforms make college tuition partially tax deductible for certain families. This should motivate more people to attend college. How will this higher demand for a college education affect tuition prices? How will it affect the cost of college for families who don’t qualify for the tax deduction?

- *8. “The future of our industrial strength cannot be left to chance. Somebody has to develop notions about which industries are winners and which are losers.” Is this statement by a newspaper columnist true? Who is the “somebody”?
9. What factors determine the cost of producing a good or service? Will producers continue to supply a good or service if consumers are unwilling to pay a price sufficient to cover the cost?
- *10. “Production should be for people and not for profit.” Answer the following questions concerning this statement:
- If production is profitable, are people helped or harmed? Explain.
 - Are people helped more if production results in a loss than if it leads to profit? Is there a conflict between production for people and production for profit?
11. What must an entrepreneur do to earn a profit? How do the actions of firms earning profits influence the value of resources? What happens to the value of resources when losses are present? If a firm making losses goes out of business, is this bad? Why or why not?
- *12. What’s wrong with this way of thinking? “Economists claim that when the price of something goes up, producers increase the quantity supplied to the market. But last year, the price of oranges was really high and the supply of them was really low. Economists are wrong!”
13. What is the invisible hand principle? Does it indicate that self-interested behavior within markets will result in actions that are beneficial to others? What conditions are necessary for the invisible hand to work well? Why are these conditions important?
- *14. What’s wrong with this way of thinking? “Economists argue that lower prices will result in fewer units being supplied. However, there are exceptions to this rule. For example, in 1972, a very simple ten-digit electronic calculator sold for \$120. By 2000, the price of the same type of calculator had declined to less than \$5. Yet business firms produced and sold many more calculators in 2000 than they did in 1972. Lower prices did not result in less production or in a decline in the number of calculators supplied.”
15. What is the difference between substitutes and complements? Indicate two goods that are substitutes for each other. Indicate two goods that are complements.
16. How is the market price of a good determined? When the market for a product is in equilibrium, how will consumers value an additional unit compared to the opportunity cost of producing that unit? Why is this important?
- *17. Do business firms operating in competitive markets have a strong incentive to serve the interest of consumers? Are they motivated by a strong desire to help consumers? Are “good intentions” necessary if individuals are going to engage in actions that are helpful to others? Discuss.
18. How do higher gasoline prices affect each of the following? Explain your answers.
- the incentive to invest in developing alternative fuels (such as coal liquefaction or solar energy)
 - use of mass transit and carpooling
 - the development of hybrid cars
19. If General Motors (GM) is earning losses, should the government step in to keep them in business with a taxpayer subsidy? What does the presence of losses say about how consumers value the company’s output relative to its cost of production? Be sure to address the effects of the policy on GM’s competitors, both domestic and foreign.

*Asterisk denotes questions for which answers are given in Appendix B.

Supply and Demand: Applications and Extensions



The division of labour, from which so many advantages are derived, is not originally the effect of any human wisdom, which foresees and intends that general opulence to which it gives occasion. It is the necessary, though very slow and gradual consequence of a certain propensity in human nature...; the propensity to truck, barter, and exchange one thing for another.

—Adam Smith¹

Nations stumble upon establishments, which are indeed the result of human action, but not the execution of any human design.

—Adam Ferguson²

CHAPTER FOCUS

- How broadly can the supply and demand framework be used?
- What happens when prices are set by law above or below the market equilibrium level?
- How do rent controls affect the maintenance and quality of rental housing? How do minimum-wage rates influence the job opportunities of low-skilled workers?
- What are “black markets”? How does the lack of a well-structured legal environment affect their operation?
- How does a tax or subsidy affect a market? What determines the distribution of the tax burden (or subsidy benefit) between buyers and sellers?
- What is the Laffer curve? What does it indicate about the relationship between tax rates and tax revenues?

¹Adam Smith, *An Inquiry into the Nature and Causes of the Wealth of Nations* (New York: Modern Library, 1937), 13.

²Adam Ferguson, *An Essay on the History of Civil Society* (Edinburgh: A. Millar and T. Caddel, London, 1767), 187.

Markets are everywhere. They exist in many different forms and degrees of sophistication. In elementary schools, children trade Pokémon cards; in households, individuals trade chores (“I’ll clean the bathroom, if you’ll clean the kitchen”); and in the stock market, individuals who have never met exchange shares of corporate stock and other financial assets worth billions of dollars each business day. Even making an activity illegal does not eliminate the market for it. Instead, the market is merely pushed underground. The exchange of illegal drugs or tickets to a big game at illegal prices illustrates this point.

Trading with other individuals is a natural part of human behavior that exists regardless of legal and societal conditions. As Adam Smith put it more than 230 years ago, human beings have a natural propensity “to truck, barter, and exchange one thing for another” (see the quotation at the chapter opening). We all want to improve our standard of living, and trade with others helps us achieve this goal—by allowing us to get the goods and services we really want and giving us the opportunity to earn the income necessary to buy them. Further, as Adam Ferguson points out, markets are a result of human action, not human design.³ They arise because people can improve their lives by trading with others.

Market prices coordinate the actions of buyers and sellers, but sometimes the “price” of a good or service in a particular market is called something different. For example, in the labor market, the price is often called the “wage rate.” In the loanable funds market, the price is generally referred to as the “interest rate.” However, as Juliet observes in Shakespeare’s *Romeo and Juliet*, “What’s in a name? That which we call a rose by any other name would smell as sweet.” The same is true for prices. When the price of something is referred to by another term, such as the wage or interest rate, it will still play the same role. Therefore, when these special terms are used, we put them along the vertical axes of supply and demand diagrams, just as we do “price”—because that’s what they are.

In the previous chapter, we saw how the forces of supply and demand determine market prices and coordinate the actions of buyers and sellers in the absence of government intervention. In this chapter, we turn our attention to using the supply and demand model to understand more fully what happens when governments intervene in markets by implementing price controls, taxes, and subsidies. ■

The Link between Resource and Product Markets

Understanding the interrelationship among markets is vitally important. A change in one market will also lead to changes in other markets. This section addresses the link between the labor and product markets.

The production process generally involves (1) the purchase of resources—like raw materials, labor services, tools, and machines; (2) transformation of the resources into products (goods and services); and (3) sale of the goods and services in a product market. Production is generally undertaken by business firms. Typically, business firms will demand resources, and households will supply them. Firms demand resources *because* they contribute to the production of goods and services. In turn, households supply them in order to earn income.

³This theme was a focus of much of the work of Nobel Prize–winning economist Friedrich Hayek.

Resource market

The market for inputs used to produce goods and services.

Just as in product markets, the demand curve in a **resource market** is typically downward-sloping and the supply curve upward-sloping. The inverse relationship between the amount of a resource demanded and its price exists because businesses will substitute away from a resource as its price rises. In contrast, there will be a direct relationship between the amount of a resource supplied and its price because a higher price means greater rewards to those who provide more. As in product markets, prices will coordinate the choices of buyers and sellers in resource markets, bringing the quantity demanded toward balance with the quantity supplied.

The labor market is a large component of the broader resource market. Actually, there is not just one market for labor, but rather there are many labor markets, one for each different skill–experience–occupational category. Let’s look at the labor market for waitstaff (waiters and waitresses). **EXHIBIT 1** shows how resource and product markets are linked. The supply of young workers in many occupations, including waitstaff, has declined in recent years in many areas of the United States. This lower supply has caused the wages (tip-inclusive wages) of waitstaff to increase (for example, from \$8 to \$10 in Exhibit 1a). The higher price of this resource increases the cost of producing restaurant meals. This higher cost, in turn, reduces the supply (shifting S_1 to S_2) of restaurant meals, pushing the price upward (Exhibit 1b). When the price of a resource increases, it will lead to higher production costs, lower supply, and higher prices for the goods and services produced with the resource.

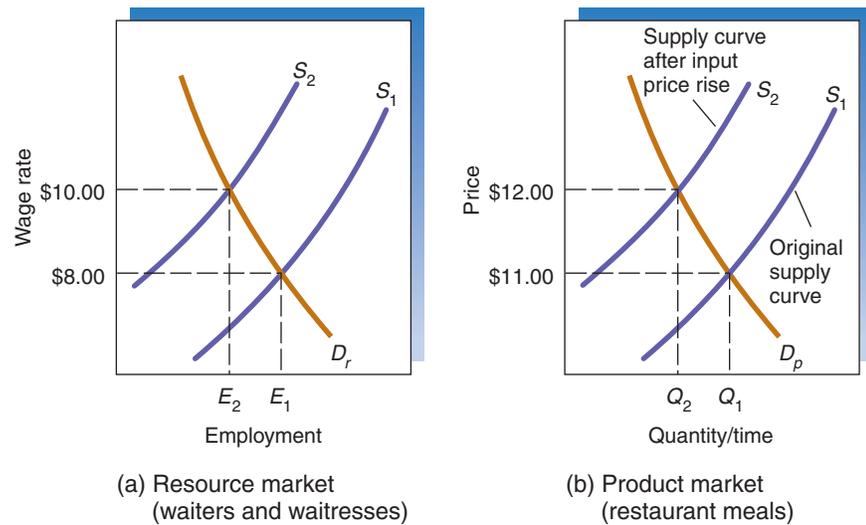
Of course, lower resource prices have the opposite effect. Lower resource prices reduce costs and expand the supply of consumer goods made with the lower-priced resources (shifting the supply curve to the right). The increase in supply will lead to a lower price in the product market. **Thus, when the price of a resource—such as labor—changes, the prices of goods and services produced with that resource will change in the same direction.**

Changes in product markets will also influence resource markets. There is a close relationship between the demand for products and the demand for the resources required for their production. An increase in demand for a consumer good—automobiles, for example—will lead to higher auto prices, which will increase the profitability of producing automobiles and give automakers an incentive to expand output. But the expansion in automobile output will require additional resources, causing an increase in the demand for, and prices of, the resources required for their production (steel, rubber, plastics, and the labor services of autoworkers, for example). The higher prices of these resources will cause other industries to conserve on their use, freeing them up for more automobile production.

Of course, the process will work in reverse if demand for a product falls. A decrease in demand will not only reduce the price of the product but will also reduce the demand

EXHIBIT 1
Resource Prices, Opportunity Cost, and Product Markets

When the supply of young workers falls, it pushes the wage rates of waiters and waitresses upward (a). In the product market (b), the higher wage rates will increase the opportunity costs of restaurants, reducing supply (shift from S_1 to S_2), thus leading to higher meal prices.



for and prices of the resources used to produce it. *Thus, when the demand for a product changes, the demand for (and prices of) the resources used to produce it will change in the same direction.*

The Economics of Price Controls

Buyers often complain that prices are too high, while sellers complain that they are too low. Unhappy with the prices established by market forces, various groups might try to persuade the government to intervene and impose **price controls**. Price controls force buyers or sellers to alter the prices of certain products. Price controls may be either price ceilings, which set a maximum legal price for a product, or price floors, which impose a minimum legal price. Imposing price controls might seem like a simple, easy way for the government to help buyers at the expense of sellers (or vice versa). The problem is that doing so typically creates secondary effects that, over time, make *both* sides worse off.

Despite good intentions, price controls can, in fact, harm the very people they were intended to help because they undermine the exchange process and reduce the gains from trade. The regulation of automated teller machine (ATM) surcharge fees is one example. Many states, after being lobbied by consumer groups, enacted regulations forbidding or severely restricting the ability of ATM owners to charge fees for using their machines. The unintended consequence of these regulations is that there are now fewer ATMs available to consumers in these states because there's less incentive to own and operate them. Consumers in these states benefit by paying lower ATM fees, but they also bear the cost of reduced ATM access.

The Impact of Price Ceilings

EXHIBIT 2 shows the impact of imposing a **price ceiling** (P_1) for a product below its equilibrium level (P_0). At the lower price, the quantity supplied by producers is lower on the supply curve, at Q_S , while the quantity demanded by consumers is greater, at Q_D , on the demand curve. A **shortage** ($Q_D - Q_S$) of the good will result because the quantity demanded by consumers exceeds the quantity supplied by producers at the new controlled price. After the price ceiling is imposed, the quantity of the good exchanged declines from the equilibrium quantity to Q_S , and the gains from trade (consumer and producer surplus) fall as well.

Normally, a higher price would ration the good to the buyers most willing to pay for it. Because the price ceiling keeps this from happening, though, other means must be used to allocate the smaller quantity Q_S among consumers wanting to purchase Q_D . Predictably, nonprice factors will become more important in the rationing process. Sellers will ration their goods and services to eager buyers on the basis of factors other than their willingness to pay. For example, sellers will be more inclined to sell their products to their friends, to buyers who do them favors, and even buyers willing to make illegal “under-the-table” payments. (The accompanying Applications in Economics box, “The Imposition of Price Ceilings After Hurricanes,” highlights this point.) Time might also be used as the rationing device, with those willing to wait in line the longest being the ones able to purchase the good. In addition, the below-equilibrium price reduces the incentive of sellers to expand the future supply of the good. At the lower price, suppliers will direct resources away from production of the good and into other, more profitable areas. As a result, the product shortage will worsen over time.

What other secondary effects can be expected? *In the real world, there are two ways that sellers can raise prices. First, they can raise their money price, holding quality constant. Or, second, they can hold the money price constant while reducing the quality of the good.* (The latter might also include reducing the size of the product, say, for example, a candy bar or a loaf of bread.) Faced with a price ceiling, sellers will use quality reductions as a way to raise their prices. Because of the government-created shortage, many consumers will buy the lower quality good rather than do without it.

Price controls

Government-mandated prices that are generally imposed in the form of maximum or minimum legal prices.

Price ceiling

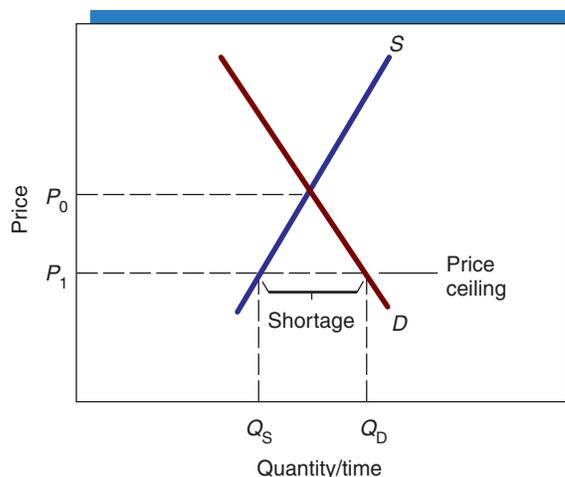
A legally established maximum price sellers can charge for a good or resource.

Shortage

A condition in which the amount of a good offered for sale by producers is less than the amount demanded by buyers at the existing price. An increase in price would eliminate the shortage.

EXHIBIT 2**The Impact of a Price Ceiling**

When a price ceiling like P_1 pushes the price of a product (rental housing, for example) below the market equilibrium, a shortage will develop. Because prices are not allowed to direct the market to equilibrium, non-price elements will become more important in rationing the good.

**APPLICATIONS IN ECONOMICS****The Imposition of Price Ceilings after Hurricanes**

Major hurricanes, such as Katrina (which hit the Gulf Coast in 2005), Andrew (south Florida in 1992), and Hugo (Charleston, South Carolina, in 1989), not only cause massive property damage and widespread power outages but also dramatically increase the local demand for items such as lumber, gasoline, ice, batteries, chain saws, and electric generators. As a result, the prices of these items rise significantly in the wake of a hurricane. After Hurricane Hugo, for example, a bag of ice that sold for \$1 before the hurricane went up in price to as much as \$10, the price of plywood rose to about \$200 per sheet, chain saws soared to the \$600 range, and gasoline sold for as much as \$10.95 per gallon.

These higher prices play two important roles. First, they encourage suppliers to bring more of these items to the disaster area. John Shepperson from Kentucky, for example, found it worthwhile to take time away from his normal job to buy nineteen generators, rent a truck, and drive it 600 miles to the Katrina-damaged area of Mississippi, expecting to sell the generators for twice the price he paid for them. Second, higher prices also encourage consumers to curtail consumption of these items, both in the disaster area and in other areas of the country where prices also rise when goods are diverted to the disaster area. The higher prices begin to subside once additional supplies flow into the disaster area, but it is precisely these higher prices that encourage this response in the first place.

In response to consumer complaints of “price gouging,” state and local officials sometimes impose price controls in the wake of a disaster. After Hurricane Hugo, the mayor of Charleston signed emergency legislation making it a crime,

punishable by up to thirty days in jail and a \$200 fine, to sell goods at prices higher than their prehurricane levels in the city.¹ Similarly, Mississippi’s attorney general announced a crackdown on price gouging after Hurricane Katrina. No matter what it is called, legislation of this type is a price control and it prohibits mutually advantageous exchange. Remember those nineteen generators John Shepperson brought to storm-ravaged Mississippi? They were confiscated by police and Shepperson was arrested for price gouging. He was held by police for four days, and his generators were kept in police custody and never made it to consumers with urgent needs who desperately wanted to buy them.

While price ceilings may be motivated by a desire to help consumers by keeping prices low, they still exert secondary effects that often retard the recovery process. At the lower mandated prices, consumer demand quickly outstrips the available supplies creating artificial shortages. The controls reduce the flow of goods into the area. Shipments that do arrive are greeted by long lines of consumers, many of whom



AP Photo/Eric Gay

APPLICATIONS IN ECONOMICS

end up without anything after waiting in lines for hours. Many of the people at the front of these lines who are able to buy the goods before supplies run out then drive those goods back out of the disaster area to sell them at the higher, uncontrolled prices in areas outside of the jurisdiction in order to obtain money to pay for much-needed repairs to their home. Shortages often become so bad that military guards are needed to protect shipments of goods and maintain order when shipments arrive.

The price controls result in serious misallocations of resources. Electric generators provide one of the best examples. The lack of electric power after a hurricane means that gasoline pumps, refrigerators, cash registers, ATMs, and many other types of electrical equipment do not work. Grocery stores can't open and inside thousands of dollars worth of food spoils. Although gas stations have gasoline in their underground storage tanks, it can't be pumped out without electricity. ATMs and banks can't operate without electricity, so people can't get to their own money, which is critical because almost all transactions in post-hurricane environments are made with cash.

Hardware stores that sell gasoline-powered electric generators typically have only a few in stock, but after a hurricane suddenly hundreds of businesses and residents want to buy them. In the absence of price controls, the price of these generators would rise and thereby allocate the limited supply to those expecting to derive the most value from them. At the higher prices, individual homeowners would generally be outbid by businesses, which can put the generators to use operating stores, gas stations, and ATMs. It is these uses that would yield enough revenue to cover the high price of the generators because they facilitate the provision of other goods and services that people desperately want. Given the large

sums grocery stores, gasoline stations, and others with urgent needs would be willing to pay, some with generators at home would even find it attractive to sell them to businesses.

However, price ceilings will prevent the generators from being allocated to those most willing to pay for them. Instead, people keep their generators at home, and it is commonplace for hardware store owners with a few generators on hand to take one home for their family and then sell the others to their close friends, neighbors, and relatives. In the absence of price rationing, nonprice factors play a larger role in the allocation process. The electric generators so critical for grocery stores, gasoline stations, and banks to open are instead used by households for tasks such as running television sets, lighting, electric razors, hair dryers, and so on. As a result, hundreds of thousands of consumers can't get goods they urgently want. Moreover, the flow of generators into the disaster area effectively stops, and many generators are actually taken out of the city to be sold in the less-damaged, outlying areas where price controls are not in effect.

If price controls were not imposed, the price of generators would quickly be bid up to the point where they were (1) purchased by those with the most urgent and valuable uses for them, and (2) imported into the area fairly rapidly because of the high prices they command. The dramatic change in conditions that often accompanies a hurricane highlights the role prices play. It also illustrates how the secondary effects accompanying price controls can magnify the damage generated by hurricanes.

¹For supporting evidence in the case of Hurricane Hugo, see David N. Laband, "In Hugo's Path, a Man-Made Disaster," *Wall Street Journal*, September 27, 1989, A22; and Tim Smith, "Economists Spurn Price Restrictions," *Greenville News*, September 28, 1989, C1.

It is important to note that a shortage is not the same as scarcity. **Scarcity is inescapable.** Scarcity exists whenever people want more of a good than nature has provided. This means, of course, that almost everything of value is scarce. **Shortages, on the other hand, are a result of prices being set below their equilibrium values—a situation that is avoidable if prices are permitted to rise.** Removing the price ceiling will allow the price to rise back to its equilibrium level (P_0 rather than P_1 in Exhibit 2). This will stimulate additional production, discourage consumption, and increase the incentive of entrepreneurs to search for and develop substitute goods. This combination of forces will eliminate the shortage.

Rent Control: A Closer Look at a Price Ceiling

Rent controls are a price ceiling intended to protect residents from high housing prices. Rent controls are currently in place in many U.S. cities, including New York City; Washington, D.C.; Newark, New Jersey; and San Jose, California. Most of these measures were enacted during either World War II or the 1970s, when inflation was high. Rent

Rent controls lead to shortages, poor maintenance, and deterioration in the quality of rental housing.



© Alex L. Fradkin/Photodisc/Getty Images

controls peaked in the mid-1980s. At that time, more than 200 cities, encompassing about 20 percent of the nation's population, imposed rent controls.

Because rent controls push the price of rental housing below the equilibrium level, the amount of rental housing demanded by consumers will exceed the amount landlords will make available. Initially, if the mandated price is only slightly below equilibrium, the impact of rent controls may be barely noticeable. Over time, however, the effects will worsen. Inevitably, rent controls that continue will lead to the following results.

1. SHORTAGES AND BLACK MARKETS WILL DEVELOP. Because the quantity of housing demanded will exceed the quantity supplied, some people who value rental housing highly will be unable to find it. Frustrated by the shortage, they will try to induce landlords to rent to them. Some will agree to prepay their rent, including a substantial damage deposit. Others might agree to rent or buy the landlord's furniture at exorbitant prices in order to get an apartment. Still others will make under-the-table (black market) payments to secure housing.

2. THE FUTURE SUPPLY OF RENTAL HOUSES WILL DECLINE. The below-equilibrium price will discourage entrepreneurs from constructing new rental housing units, and private investment will flow elsewhere. In the city of Berkeley, rental units available to students at the University of California dropped by 31 percent in the first five years after the city adopted rent controls in 1978.⁴ In contrast, removal of rent controls will often lead to a sharp increase in rental housing construction, as builders seek to expand the supply that lagged behind as the result of the controls. This happened in both Boston and Santa Monica following their repeal of controls in the late 1990s.

3. THE QUALITY OF RENTAL HOUSING WILL DETERIORATE. When apartment owners are not allowed to raise their prices, they will use quality reductions to achieve this objective. Normal maintenance and repair service will deteriorate. Tenant parking lots will be eliminated (or rented out). Eventually, the quality of the rental housing will reflect the controlled price. Cheaper housing will be of cheaper quality.

⁴William Tucker, *The Excluded Americans* (Washington, DC: Regnery Gateway, 1990), 162. For additional information on rent controls, see William Tucker, "Rent Control Drives Out Affordable Housing," in *USA Today Magazine* (July 1998) and Walter Block, "Rent Controls," in *Fortune Encyclopedia of Economics*, ed. David Henderson (New York: Warner Books, 1993). The latter publication can also be found online at <http://www.econlib.org>.

4. NONPRICE METHODS OF RATIONING WILL BECOME MORE IMPORTANT. Because price no longer rations rental housing, other forms of competition will develop. Landlords will rely more heavily on nonmonetary discriminating devices. They will favor friends, people of influence, and those whose lifestyles resemble their own. In contrast, applicants with many children or unconventional lifestyles, and perhaps racial minorities, will find fewer landlords who will rent to them. Because the cost to landlords of discriminating against those they do not like is lower, discrimination will become more prevalent in the rationing process. In New York City, where rent controls are in force, a magazine article suggested that “joining a church or synagogue” could help people make the connections they need to get an apartment. Can you imagine having to devote this amount of effort to finding an apartment? If your city enacts rent controls, you just might have to.

5. INEFFICIENT USE OF HOUSING SPACE WILL RESULT. The tenant in a rent-controlled apartment will think twice before moving. Why? Even though the tenant might want a larger or smaller space or an apartment closer to work, he or she will be less likely to move because it will be much more difficult to find a unit that’s vacant. Turnover will be lower, and many people will find themselves in locations and in apartments not well suited to their needs. In a college town, students who live in the local area will have an advantage over newcomers. Local students and their parents will be more likely to have connections with apartment owners in the area. Many students from farther away, including those who value the apartments more highly, will find it extremely difficult to locate a place to rent.

Imposing rent control laws may sound like a simple way to deal with high housing prices. However, the secondary effects are so damaging that many cities have begun repealing them. In the words of Swedish economist Assar Lindbeck: “In many cases, rent control appears to be the most efficient technique presently known to destroy a city—except for bombing.”⁵ Though this may overstate the case, both economics and experience show that the controls adversely impact the quantity and quality of rental housing.

The Impact of Price Floors

A **price floor** establishes a minimum price that can legally be charged. The government imposes price floors on some agricultural products, for example, in an effort to artificially increase the prices that farmers receive. When a price floor is imposed above the current market equilibrium price, it will alter the market’s operation. **EXHIBIT 3** illustrates the impact of imposing a price floor (P_1) for a product above its equilibrium level (P_0). At the higher price, the quantity supplied by producers increases along the supply curve to Q_s , while the quantity demanded by consumers decreases along the demand curve to Q_D . A **surplus** ($Q_s - Q_D$) of the good will result, as the quantity supplied by producers exceeds the quantity demanded by consumers at the new controlled price. Just like a price ceiling, a price floor reduces the quantity of the good exchanged, and reduces the gains from trade.

As in the case of the price ceiling, nonprice factors will play a larger role in the rationing process. But because there is a surplus rather than a shortage, this time buyers will be in a position to be more selective. Buyers will purchase from sellers willing to offer them nonprice favors—better service, discounts on other products, or easier credit terms, for example. When it’s difficult to alter the product’s quality—in this case, improve it to make it more attractive for the price that must be charged—some producers will be unable to sell it.

It is important to note that a surplus doesn’t mean the good is no longer scarce. People still want more of the good than is freely available from nature, even though they want less of it *at the controlled price* than sellers want to bring to the market. A decline in price would eliminate the surplus, but the item will be scarce in either case.

Price floor

A legally established minimum price buyers must pay for a good or resource.

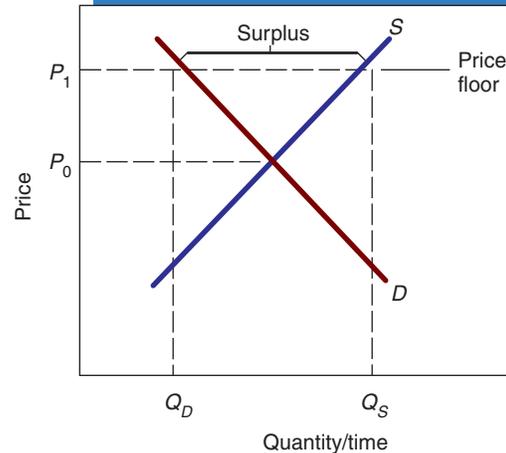
Surplus

A condition in which the amount of a good offered for sale by producers is greater than the amount that buyers will purchase at the existing price. A decline in price would eliminate the surplus.

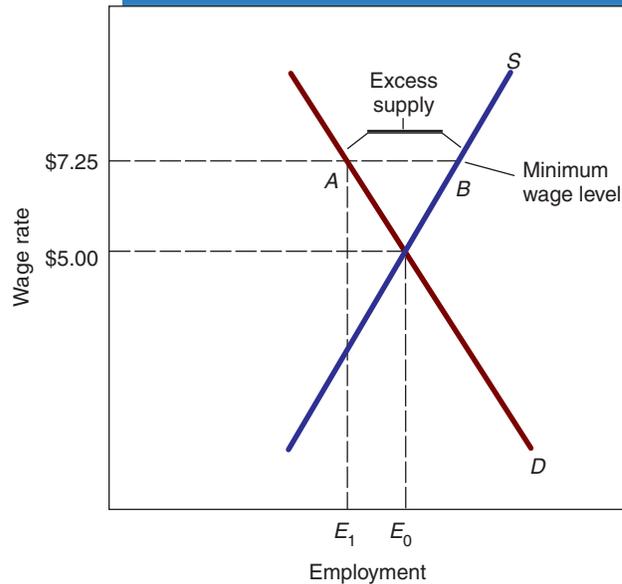
⁵Assar Lindbeck, *The Political Economy of the New Left* (New York: Harper & Row, 1972), 39.

EXHIBIT 3**The Impact of a Price Floor**

When a price floor such as P_1 keeps the price of a good or service above the market equilibrium, a surplus will result.

**EXHIBIT 4****Employment and the Minimum Wage**

If the market wage of a group of employees is \$5.00 per hour, a \$7.25-per-hour minimum wage will increase the earnings of workers able to retain their jobs, but reduce the employment opportunities of others as the number of jobs available shrinks from E_0 to E_1 .



Minimum Wage: A Closer Look at a Price Floor

In 1938, Congress passed the Fair Labor Standards Act, which mandated a national **minimum wage** of 25 cents per hour. During the past seventy years, the minimum wage has been increased many times. Most recently, in July 2009, the minimum wage was increased to \$7.25 per hour. Numerous states, including California, Washington, Oregon, and Connecticut, have their own higher minimum-wage rates ranging up to over \$8 per hour.

A minimum wage is a price floor. Because most employees in the United States earn wages in excess of the minimum, their employment opportunities are largely unaffected by the minimum wage law. However, low-skilled and inexperienced workers whose equilibrium wage rates are lower than the minimum wage will be affected. **EXHIBIT 4** shows the direct effect of a \$7.25-per-hour minimum wage on the employment opportunities of a group of low-skilled workers.

Without a minimum wage, the supply of and demand for these low-skilled workers would be in balance at some lower wage rate; here we use \$5.00. Because the minimum

Minimum wage

Legislation requiring that workers be paid at least the stated minimum hourly rate of pay.

wage makes low-skilled labor more expensive, employers will substitute machines and more highly skilled workers for the now more expensive low-skilled employees. Fewer low-skilled workers will be hired when the minimum wage pushes their wages up. Graphically, this is reflected in the movement up along the demand curve in Exhibit 4 from the equilibrium point to the point associated with the higher, \$7.25 wage rate (point A). The result will be a reduction in employment of low-skilled workers from E_0 to E_1 .

On the supply side of the market, as the wages of low-skilled workers are pushed above equilibrium, there will be more unskilled workers looking for jobs. Graphically, this is reflected in the movement up along the supply curve in Exhibit 4 from the equilibrium point to the point associated with the higher, \$7.25 wage rate (point B). At the \$7.25 wage rate, the quantity of workers searching for jobs will exceed the quantity of jobs available, causing excess supply.

In a labor market, an excess supply will take the form of an abnormally high rate of unemployment. Thus, ***economic analysis indicates that minimum-wage legislation will lead to high unemployment rates among low-skilled workers.*** The exceedingly high unemployment rate of teenagers in the United States (a group with limited skills because they lack work experience) is consistent with this analysis. In the United States, the unemployment rate for teenagers is more than three times the average for all workers, and the unemployment rate for black youth has generally exceeded 30 percent in recent years.

It is important to remember that the market price—the wage rate—is only one dimension of the transaction. When a price floor pushes the wage rate above equilibrium, employers will have less incentive to offer nonwage benefits to employees because they will have no trouble hiring low-skilled workers. Predictably, a higher minimum wage will lead to a deterioration of the nonwage qualities of minimum-wage jobs, and so workers in these jobs will experience less convenient working hours, fewer training opportunities, and less continuous employment.

The adverse impact of the minimum wage on the opportunity of youthful workers to acquire work experience and on-the-job training is a particularly important unintended consequence of minimum-wage laws. Low-paying, entry-level jobs can provide workers with experience that will help them move up the job ladder to higher-paying positions. Employment experience obtained at an early age, even on menial tasks, can help people acquire self-confidence, good work habits, and skills that make them more valuable to future employers. The minimum wage makes this more difficult. Not only does the minimum wage make it harder for low-skilled workers to find jobs, it also reduces their on-the-job training opportunities. In order to pay the higher wage rate required by the law, employers will have to find other ways to cut employment costs, like reducing the amount of job training. Not surprisingly, most minimum-wage jobs are dead-end positions with little opportunity for future advancement.⁶

Workers who are able to maintain their employment at the higher minimum-wage rate—most likely the better qualified among those with low skill levels—gain from a minimum wage. But other low-skilled workers are harmed by the minimum wage, particularly those with the lowest skill levels who will find it more difficult to get jobs.

How many fewer low-skilled workers are hired because of the minimum wage? Studies indicate that a 10 percent increase in the minimum wage reduces the employment of low-skilled workers by 1 to 3 percent. Minimum-wage supporters argue that the higher wages for low-skilled workers are worth this reduction in employment and job-training opportunities. Critics argue, however, that the reduced job opportunities for the lowest-skilled workers are reason enough to eliminate the minimum wage.

Does the minimum wage help the poor? According to the U.S. Department of Labor, most minimum wage earners are young, part-time workers and relatively few live below the poverty line. About one-half of minimum wage workers are between the ages of 16 to 24 years and approximately three-fifths hold a part-time job. Fewer than

⁶For evidence that the minimum wage limits training opportunities, see David Neumark and William Wascher, "Minimum Wages and Training Revisited," *Journal of Labor Economics* 19 (July 2001): 563–95.

20 percent of minimum wage workers are from families below the poverty line, and only about one out of every four minimum wage workers is married. Therefore, even if the adverse effects of a higher minimum wage on employment and training opportunities are small, a higher minimum wage does little to help the poor, making it a much less attractive antipoverty program than other alternatives.⁷

Black Markets and the Importance of the Legal Structure

When price controls are imposed, exchanges at prices outside of the range set by the government are illegal. Governments may also make it entirely illegal to buy and sell certain products. This is the case with drugs like marijuana and cocaine in the United States. Similarly, prostitution is illegal in all states except Nevada. However, controlling prices and making a good or service illegal doesn't eliminate market forces. When demand is strong and gains from trade can be had, markets will develop and exchanges will occur in spite of the restrictions. People will also engage in illegal exchanges in order to evade taxes. For example, the \$3.00 per-pack cigarette tax in New York City has made cigarette smuggling in that city a thriving business.

Markets that operate outside the legal system are called **black markets**. How do black markets work? Can markets function without the protection of the law? As in other markets, supply and demand will determine prices in black markets, too. However, because black markets operate outside the official legal structure, enforcement of contracts and the dependability of quality will be less certain. Furthermore, participation in black markets involves greater risk, particularly for suppliers. Prices in these markets will have to be higher than they otherwise would be to compensate suppliers for the risks they are taking—the threat of arrest, possibility of a fine or prison sentence, and so on. Perhaps most important, in black markets there are no legal channels for the peaceful settlement of disputes. When a buyer or seller fails to deliver, it is the other party who must try to enforce the agreement, usually through the use or threat of physical force.

Compared with normal markets, black markets are characterized by a higher incidence of defective products, higher profit rates (for those who do not get caught), and more violence. The incidence of phony tickets purchased from street dealers selling them at illegal prices and deaths caused by toxic, illicit drugs are reflections of the high presence of defective goods in these markets. Certainly, the expensive clothes and automobiles of many drug dealers suggest that monetary profits are high in black markets. Evidence of violence as a means of settling disputes arising from black-market transactions is widespread. Crime statistics in urban areas show that a high percentage of the violent crimes, including murder, are associated with illegal trades gone bad and competition among dealers in the illegal drug market.

The prohibition of alcohol in the United States from 1920 to 1933 vividly illustrates how violence, deception, and fraud plague markets that operate outside the law. When the production and sale of alcohol were illegal during the Prohibition era, gangsters dominated the alcohol trade, and the murder rate soared to record highs. There were also problems with product quality (tainted or highly toxic mixtures, for example) similar to the ones present in modern-day illegal-drug markets. When Prohibition was repealed and the market for alcoholic beverages began operating once again within the legal framework, these harmful secondary effects disappeared.

The operation of black markets highlights a point often taken for granted: *A legal system that provides for secure private-property rights, contract enforcement, and*

Black market

A market that operates outside the legal system in which either illegal goods are sold or legal goods are sold at illegal prices or terms.

⁷See David Neumark and William Wascher, "Do Minimum Wages Fight Poverty?" *Economic Inquiry* 40 (July 2002): 315–33; David Neumark and William Wascher, "The Effects of Minimum Wages Throughout the Wage Distribution," *Journal of Human Resources* 39 (April 2004): 425–50; and Richard V. Burkhauser and Joseph J. Sabia, "The Effectiveness of Minimum-Wage Increases in Reducing Poverty: Past, Present, and Future," *Contemporary Economic Policy* 25 (April 2007): 262–81, for evidence of this point.

access to an unbiased court system for settling disputes is vitally important for the smooth operation of markets. Markets will exist in any environment, but they can be counted on to function efficiently only when property rights are secure and contracts are impartially enforced.

The analysis of black markets also provides insights into the economies of Russia, Ukraine, and other parts of the former Soviet Union. Following the collapse of communism, the legal systems in these areas reflected the prior socialist nature of these economies. Both the protection of private property and the enforcement of contracts between private parties were highly uncertain. People with political connections were often able to escape their contractual responsibilities and obtain favorable rulings from legal and regulatory authorities. As a result, markets in these countries operated much like

black markets. Fraud and deception were commonplace, and the incidence of violence related to business dealings was widespread. The uncertainty accompanying this legal environment was a major contributor to the poor performance of these economies in the aftermath of communism.



Christia Brunt/istockphoto.

Black markets like those for illegal drugs are characterized by less dependable product quality and the greater use of violence to settle disputes between buyers and sellers.

The Impact of a Tax

How do taxes affect market exchange? When governments tax goods, who bears the burden? Economists use the term **tax incidence** to indicate how the burden of a tax is *actually* shared between buyers (who pay more for what they purchase) and sellers (who receive less for what they sell). When a tax is imposed, the government can make either the buyer or the seller legally responsible for payment of the tax. The legal assignment is called the *statutory incidence* of the tax. However, the person who writes the check to the government—that is, the person statutorily responsible for the tax—is not always the one who bears the tax burden. The *actual incidence* of a tax may lie elsewhere. If, for example, a tax is placed statutorily on a seller, the seller might simply increase the price of the product. In this case, the buyers end up bearing some, or all, of the tax burden through the higher price.

To illustrate, **EXHIBIT 5** shows how a \$1,000 tax placed on the sale of used cars would affect the market. (To simplify this example, let's assume all used cars are identical.) Here, the tax has statutorily been placed on the seller. When a tax is imposed on the seller, it shifts the supply curve upward by exactly the amount of the tax—\$1,000, in this example. To understand why, remember that the height of the supply curve at a particular quantity shows the minimum price required to cause enough sellers to offer that quantity of cars for sale. Suppose you were a potential seller, willing to sell your car for any price

Tax incidence

The way the burden of a tax is distributed among economic units (consumers, producers, employees, employers, and so on). The actual tax burden does not always fall on those who are statutorily assigned to pay the tax.

over \$6,000, but you would keep it unless you could pocket at least \$6,000 from the sale. Because you now have to pay a tax of \$1,000 when you sell your car, the minimum price you will accept *from the buyer* will rise to \$7,000, so that after paying the tax, you will retain \$6,000. Other potential sellers will be in a similar position. The tax will push the minimum price each seller is willing to accept upward by \$1,000. Thus, the after-tax supply curve will shift vertically by this amount.

Sellers would prefer to pass the entire tax on to buyers by raising prices by the full amount of the tax, rather than paying any part of it themselves. However, as sellers begin to raise prices, customers respond by purchasing fewer units. At some point, to avoid losing additional sales, some sellers will find it more profitable to accept part of the tax burden themselves (in the form of a lower price net of tax), rather than to raise the price by the full amount of the tax. This process is shown in Exhibit 5.

Before the tax was imposed, used cars sold for a price of \$7,000 (at the intersection of the original supply and demand curves shown by point A). After the \$1,000 tax is imposed, the equilibrium price of used cars will rise to \$7,400 (to point B, the intersection of the new supply curve including the tax, and the demand curve). Thus, despite the tax being statutorily imposed on sellers, the higher price shifts some of the tax burden to buyers. Buyers will now pay \$400 more for used cars. Sellers now receive \$7,400 from the sale of their used cars. However, after sending \$1,000 in taxes to the government, they retain only \$6,400. This is exactly \$600 less than the seller would have received had the tax not been imposed. Because the distance between the supply curves is exactly \$1,000, this net price can be found in Exhibit 5 by following the vertical line down from the new equilibrium (point B) to the original supply curve (point C) and over to the price axis. In this case, each \$1,000 of tax revenue transferred to the government imposes a burden of \$400 on buyers (in the form of higher used-car prices) and a \$600 burden on sellers (in the form of lower net receipts from a car sale), even though sellers are responsible for actually sending the \$1,000 tax payment to the government.

The tax revenue derived from a tax is equal to the **tax base** (in this case, the number of used cars exchanged) multiplied by the **tax rate**. After the tax is imposed, the quantity

Tax base

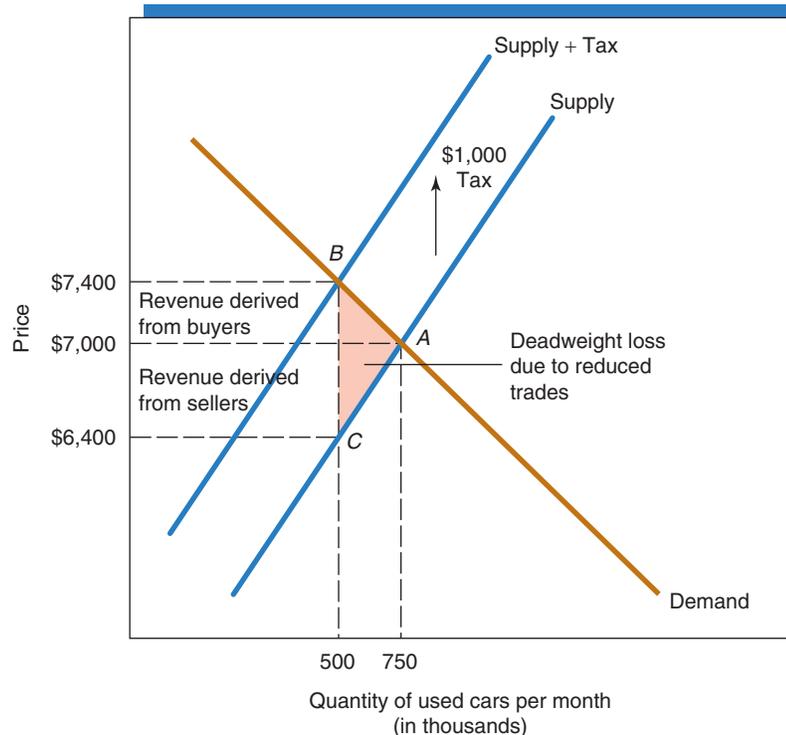
The level or quantity of an economic activity that is taxed. Higher tax rates reduce the level of the tax base because they make the activity less attractive.

Tax rate

The per-unit amount of the tax or the percentage rate at which the economic activity is taxed.

EXHIBIT 5
The Impact of a Tax Imposed on Sellers

When a \$1,000 tax is imposed statutorily on the sellers of used cars, the supply curve shifts vertically upward by the amount of the tax. The price of used cars to buyers rises from \$7,000 to \$7,400, resulting in buyers bearing \$400 of the burden of this tax. The price received by a seller falls from \$7,000 to \$6,400 (\$7,400 minus the \$1,000 tax), resulting in sellers bearing \$600 of the burden.



exchanged will fall to 500,000 cars per month because some buyers will choose not to purchase at the \$7,400 price, and some sellers will decide not to sell when they are able to net only \$6,400. Given the after-tax quantity sold, the monthly revenue derived from the tax will be \$500 million (500,000 cars multiplied by \$1,000 tax per car).

The Deadweight Loss Caused by Taxes

As Exhibit 5 shows, a \$1,000 tax on used cars causes the number of units exchanged to fall from 750,000 to 500,000. It reduces the quantity of units exchanged by 250,000 units. Remember, trade results in mutual gains for both buyers and sellers. The loss of the mutual benefits that would have been derived from these additional 250,000 units also imposes a cost on buyers and sellers. But this cost—the loss of the gains from trade eliminated by the tax—does not generate any revenue for the government. Economists call this the **deadweight loss** of taxation. In Exhibit 5, the size of the triangle *ABC* measures the deadweight loss. The deadweight loss is a burden imposed on buyers and sellers over and above the cost of the revenue transferred to the government. Sometimes it is referred to as the **excess burden of taxation**. It is composed of losses to both buyers (the lost consumer surplus consisting of the upper part of the triangle *ABC*) and sellers (the lost producer surplus consisting of the lower part of the triangle *ABC*).

The deadweight loss to sellers includes an indirect cost imposed on the people who supply resources to that industry (such as its suppliers and employees). The 1990 luxury-boat tax provides a good example. Supporters of the luxury-boat tax assumed the tax burden would fall primarily on wealthy yacht buyers. The actual effects were quite different, though. Because of the tax, luxury-boat sales fell sharply and thousands of workers lost their jobs in the yacht-manufacturing industry. The deadweight loss triangle might seem like an abstract concept, but it wasn't so abstract to the employees in the yacht industry who lost their jobs! Their losses are part of what is reflected in the triangular area. Moreover, because luxury-boat sales declined so sharply, the tax generated only a meager amount of revenue. The large deadweight loss (or excess burden) combined with meager revenue for the government eventually led to the repeal of the tax.

Actual versus Statutory Incidence

Economic analysis indicates that the actual burden of a tax—or more precisely, the split of the burden between buyers and sellers—does not depend on whether the tax is statutorily placed on the buyer or the seller. To see this, we must first look at how the market responds to a tax statutorily placed on the buyer. Continuing with the auto tax example, let's suppose that the government places the \$1,000 tax on the buyer of the car, rather than the seller. After making a used-car purchase, the buyer must send a check to the government for \$1,000. Imposing a tax on buyers will shift the demand curve downward by the amount of the tax, as shown in **EXHIBIT 6**. This is because the height of the demand curve represents the maximum price a buyer is willing to pay for the car. If a particular buyer is willing and able to pay only \$5,000 for a car, the \$1,000 tax would mean that the most the buyer would be willing to pay *to the seller* would be \$4,000. This is because the total cost to the buyer is now the purchase price plus the tax.

As Exhibit 6 shows, the price of used cars falls from \$7,000 (point *A*) to \$6,400 (point *B*) when the tax is statutorily placed on the buyer. Even though the tax is placed on buyers, the reduction in demand that results causes the price received by sellers to fall by \$600. Thus, \$600 of the tax is again borne by sellers, just as it was when the tax was placed statutorily on them. From the buyer's standpoint, a car now costs \$7,400 (\$6,400 paid to the seller plus \$1,000 in tax to the government). Just as when the tax was imposed on the seller, the buyer now pays \$400 more for a used car.

A comparison of Exhibits 5 and 6 makes it clear that the actual burden of the \$1,000 tax is independent of its statutory incidence. In both cases, buyers pay a total price of \$7,400 for the car (a \$400 increase from the pretax level), and sellers receive \$6,400 from the sale (a \$600 decrease from the pretax level). Correspondingly, the revenue

Deadweight loss

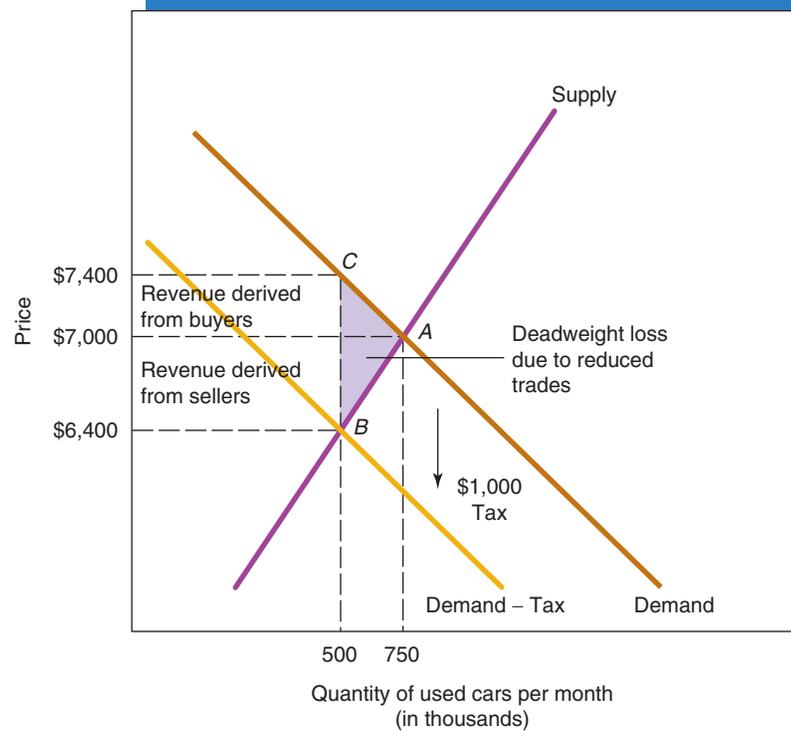
The loss of gains from trade to buyers and sellers that occurs when a tax is imposed. The deadweight loss imposes a burden on both buyers and sellers over and above the actual payment of the tax.

Excess burden of taxation

Another term for deadweight loss. It reflects losses that occur when beneficial activities are forgone because they are taxed.

EXHIBIT 6**The Impact of a Tax Imposed on Buyers**

When a \$1,000 tax is imposed statutorily on the buyers of used cars, the demand curve shifts vertically downward by the amount of the tax. The price of used cars falls from \$7,000 to \$6,400, resulting in sellers bearing \$600 of the burden. The buyer's total cost of purchasing the car rises from \$7,000 to \$7,400 (\$6,400 plus the \$1,000 tax), resulting in buyers bearing \$400 of the burden of this tax. The incidence of this tax on used cars is the same regardless of whether it is statutorily imposed on buyers or sellers.



derived by the government, the number of sales eliminated by the tax, and the size of the deadweight loss are identical whether the law requires payment of the tax by the sellers or by the buyers. A similar phenomenon occurs with any tax. The 15.3 percent Social Security payroll tax, for example, is statutorily levied as 7.65 percent on the employee and 7.65 percent on the employer. The impact is to drive down the net pay received by employees and raise the employers' cost of hiring workers. Economic analysis tells us that the actual burden of this tax will probably differ from its legal assignment, and that it will be the same regardless of how the tax is statutorily assigned. Because market prices (here, workers' gross wage) will adjust, the incidence of the tax will be identical regardless of whether the 15.3 percent is levied on employees or on employers or is divided between the two parties.

Elasticity and the Incidence of a Tax

If the actual incidence of a tax is independent of its statutory assignment, what does determine the incidence? The answer: The incidence of a tax depends on the responsiveness of buyers and of sellers to a change in price. When buyers respond to even a small increase in price by leaving the market and buying other things, they will not be willing to accept a price that is much higher than it was prior to the tax. Similarly, if sellers respond to a small reduction in what they receive by shifting their goods and resources to other markets, or by going out of business, they will not be willing to accept a much smaller payment, net of tax. The burden of a tax—its incidence—tends to fall more heavily on whichever side of the market has the least attractive options elsewhere—the side of the market that is less sensitive to price changes, in other words.

In the preceding chapter, we saw that the steepness of the supply and demand curves reflects how responsive producers and consumers are to a price change. Relatively inelastic demand or supply curves are steeper (more vertical), indicating less responsiveness to a change in price. Relatively elastic demand or supply curves are flatter (more horizontal), indicating a higher degree of responsiveness to a change in price.



The actual burden of a tax is independent of whether it is imposed on buyers or sellers.

Using gasoline as an example, part (a) of **EXHIBIT 7** illustrates the impact of a tax when demand is relatively inelastic and supply is relatively elastic. It will not be easy for gasoline consumers to shift—particularly in the short run—to other fuels in response to an increase in the price of gasoline. The inelastic demand curve shows this. When a 50-cent per gallon tax is imposed on gasoline (roughly the current average of combined federal and state taxes), buyers end up paying 40 cents more per gallon (\$3.00 instead of \$2.60), while the net price received by sellers is only 10 cents less (\$2.50 instead of \$2.60). **When demand is relatively inelastic, or supply is relatively elastic, buyers will bear the larger share of the tax burden.**

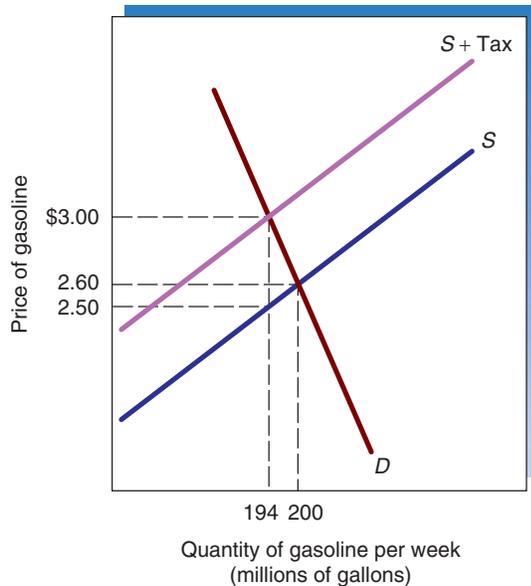
Conversely, when demand is relatively elastic and supply is inelastic, more of the tax burden will fall on sellers and resource suppliers. The luxury-boat tax illustrates this point. As we mentioned earlier, Congress imposed a tax on the sale of luxury boats in 1990. Later, the tax was repealed because of its adverse impact on sales and employment in the industry. There are many things wealthy potential yacht owners can spend their money on other than luxury boats sold in the United States. For one thing, they can buy a yacht someplace else, perhaps in Mexico, England, or the Bahamas. Or they can spend more time on the golf course, travel to exotic places, or purchase a nicer car or a vacation home. Because there are attractive substitutes, the demand for domestically produced luxury boats is relatively elastic compared with supply. Therefore, as Exhibit 7b illustrates, when a \$25,000 tax is imposed on luxury boats, prices rise by only \$5,000 (from \$100,000 to \$105,000), but output falls substantially (from 10,000 to 5,000 boats). The net price received by sellers falls by \$20,000 (from \$100,000 to \$80,000 per boat). **When demand is relatively elastic, or supply is relatively inelastic, sellers (including resource suppliers) will bear the larger share of the tax burden.**

Elasticity and the Deadweight Loss

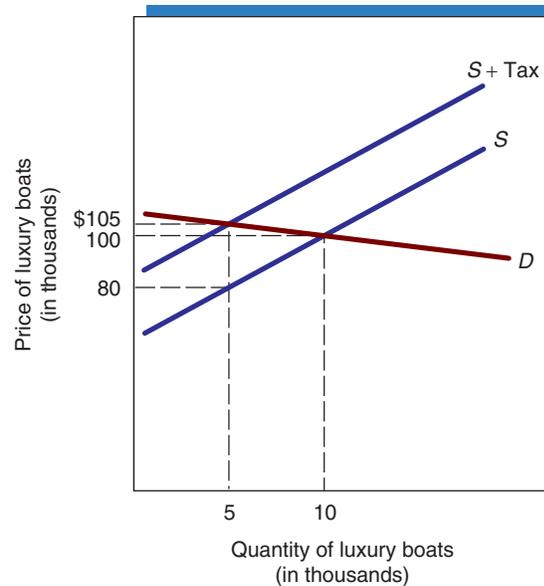
We have seen that the elasticities of supply and demand determine how the burden of a tax is distributed between buyer and seller. They also influence the size of the deadweight loss caused by the tax because they determine the total reduction in the quantity exchanged. When either demand or supply is relatively inelastic, fewer trades will be eliminated by the tax, so the deadweight loss will be smaller. From a policy perspective, the excess burden of a tax system will therefore be lower if taxes are levied on goods and services for which either demand or supply is highly inelastic.

EXHIBIT 7**How the Burden of a Tax Depends on the Elasticities of Demand and Supply**

In part (a), when demand is relatively more inelastic than supply, buyers bear a larger share of the burden of the tax. In part (b), when supply is relatively more inelastic than demand, sellers bear a larger share of the tax burden.



(a) Tax on gasoline



(b) Tax on luxury boats

Tax Rates, Tax Revenues, and the Laffer Curve

It is important to distinguish between the average and marginal rates of taxation. They can be very different, and both provide important information. The average tax rate is generally used to examine how different income groups are burdened by a tax, whereas the marginal tax rate is the key to understanding the negative economic effects created by a tax. Both can be computed with simple equations. The **average tax rate (ATR)** can be expressed as follows:

$$\text{ATR} = \frac{\text{Tax liability}}{\text{Taxable income}}$$

For example, if a person's tax liability was \$3,000 on an income of \$20,000, her average tax rate would be 15 percent (\$3,000 divided by \$20,000). The average tax rate is simply the percentage of income that is paid in taxes.

In the United States, the personal income tax provides the largest single source of government revenue. This tax is particularly important at the federal level. You may have heard that the federal income tax is "progressive." A **progressive tax** is defined as a tax in which the average tax rate rises with income. In other words, people with higher income pay a larger *percentage of their income* in taxes. Alternatively, taxes can be proportional or regressive. A **proportional tax** is defined as a tax in which the average tax rate remains the same across income levels. Under a proportional tax, everyone pays the same percentage of their income in taxes. Finally, a **regressive tax** is defined as a tax in which the average tax rate falls with income. If someone making \$100,000 per year paid \$30,000 in taxes (an ATR of 30 percent) while someone making \$30,000 per year paid \$15,000 in taxes (an ATR of 50 percent), the tax code would be regressive. Note that a regressive tax merely means that the *percentage* paid in taxes declines with income; the actual dollar amount of the tax bill might still be higher for those with larger incomes.

Average tax rate (ATR)

Tax liability divided by taxable income. It is the percentage of income paid in taxes.

Progressive tax

A tax in which the average tax rate rises with income. People with higher incomes will pay a higher percentage of their income in taxes.

Proportional tax

A tax in which the average tax rate is the same at all income levels. Everyone pays the same percentage of income in taxes.

Regressive tax

A tax in which the average tax rate falls with income. People with higher incomes will pay a lower percentage of their income in taxes.

Although the average tax rate is useful in determining whether an income tax is progressive, proportional, or regressive, it is the marginal tax rate that concerns individuals when they are making decisions. It is the marginal tax rate that determines how much of an additional dollar of income must be paid in taxes (and thus, also, how much one gets to keep). An individual's marginal tax rate can be very different from his or her average tax rate. The **marginal tax rate (MTR)** can be expressed as follows:

$$\text{MTR} = \frac{\text{Change in tax liability}}{\text{Change in taxable income}}$$

The MTR reveals both how much of one's *additional* income must be turned over to the tax collector and how much is retained by the individual taxpayer. For example, when the MTR is 25 percent, \$25 of every \$100 of additional earnings must be paid in taxes. The individual is permitted to keep only \$75 of his or her additional income, in other words. The marginal tax rate is vitally important because it affects the incentive to earn additional income. The higher the marginal tax rate, the less incentive individuals have to earn more income. At high marginal rates, for example, many spouses will choose to stay home rather than take a job, and others will choose not to take on second jobs or extra work. **EXHIBIT 8** shows the calculation of both the average and marginal tax rates within the framework of the 2008 income tax tables provided to taxpayers.

Generally, a person's income is subject to several different taxes, and it is the combined marginal tax rate of all of them that matters when it comes to decision making. For example, a recent college graduate with \$33,000 in taxable income living in Baltimore, Maryland, would face a 25 percent marginal federal income tax rate, a 7.65 percent marginal Social Security payroll tax rate, a 4.75 percent marginal state income tax rate, and a 3.05 percent marginal local income tax rate. If we ignore the relatively small deductions that one tax can generate in calculating certain others, the result is a combined marginal tax rate of 40.45 percent, meaning that an additional \$100 of gross income would result in only a \$59.55 increase in net take-home income.

Governments generally levy taxes to raise revenue. The revenue derived from a tax is equal to the tax base multiplied by the tax rate. As we previously noted, taxes will lower the level of the activity taxed. When an activity is taxed more heavily, people will choose to do less of it. The higher the tax rate, the greater the shift away from the activity. If taxpayers can easily escape the tax by altering their behavior (perhaps by shifting to substitutes), the tax base will shrink significantly as rates are increased. This erosion in the tax base in response to higher rates means that an increase in tax rates will generally lead to a less-than-proportional increase in tax revenue.

Economist Arthur Laffer popularized the idea that, beyond some point, higher tax rates will shrink the tax base so much that tax revenue will actually begin to decline when tax rates are increased. The curve illustrating the relationship between tax rates and tax revenues is called the **Laffer curve**. **EXHIBIT 9** illustrates the concept of the Laffer curve as it applies to income taxes. Obviously, tax revenue would be zero if the income tax rate were zero. What isn't so obvious is that tax revenue would also be zero (or at least very close to zero) if the tax rate were 100 percent. Confronting a 100 percent tax rate, most individuals would go fishing or find something else to do rather than engage in taxable productive activity, since the 100 percent tax rate would eliminate all personal reward derived from earning taxable income. Why work when you have to give every penny of your earnings to the government?

As tax rates are reduced from 100 percent, the incentive to work and earn taxable income increases, income expands, and tax revenue rises. Similarly, as tax rates increase from zero, tax revenue expands. Clearly, at some rate greater than zero but less than 100 percent, tax revenue will be maximized (point *B* in Exhibit 9). This is not to imply that the tax rate that maximizes revenue is the ideal, or optimal, tax rate from the standpoint of the economy as a whole. Although it might be the tax rate that generates the most revenue for government, we must also consider the welfare reductions imposed on individuals by the deadweight loss created by the tax. As rates are increased and the maximum revenue point (*B*) is approached, relatively large tax rate increases will be necessary to expand tax

Marginal tax rate (MTR)

The additional tax liability a person faces divided by his or her additional taxable income. It is the percentage of an extra dollar of income earned that must be paid in taxes. It is the marginal tax rate that is relevant in personal decision making.

Laffer curve

A curve illustrating the relationship between the tax rate and tax revenues. Tax revenues will be low at both very high and very low tax rates. When tax rates are quite high, lowering them can increase tax revenue.

EXHIBIT 8**Average and Marginal Tax Rates in the Income Tax Tables**

This excerpt from the 2008 federal income tax table shows that in the 25 percent federal marginal income tax bracket, each \$100 of additional taxable income a single taxpayer earns (\$33,000 versus \$33,100, for example) causes his or her tax liability to increase by \$25 (from \$4,600 to \$4,625). Note that the average tax rate for a single taxpayer at \$33,000 is about 14 percent (\$4,600 divided by \$33,000), even though the taxpayer's marginal rate is 25 percent.

2008 Tax Table—Continued

If line 43 (taxable income) is—		Your tax is—			
At least	But less than	Single	Married filing jointly	Married filing sepa- rately	Head of a house- hold
33,000					
33,000	33,050	4,600	4,151	4,600	4,381
33,050	33,100	4,613	4,159	4,613	4,389
33,100	33,150	4,625	4,166	4,625	4,396
33,150	33,200	4,638	4,174	4,638	4,404
33,200	33,250	4,650	4,181	4,650	4,411
33,250	33,300	4,663	4,189	4,663	4,419
33,300	33,350	4,675	4,196	4,675	4,426
33,350	33,400	4,688	4,204	4,688	4,434
33,400	33,450	4,700	4,211	4,700	4,441
33,450	33,500	4,713	4,219	4,713	4,449
33,500	33,550	4,725	4,226	4,725	4,456
33,550	33,600	4,738	4,234	4,738	4,464
33,600	33,650	4,750	4,241	4,750	4,471
33,650	33,700	4,763	4,249	4,763	4,479
33,700	33,750	4,775	4,256	4,775	4,486
33,750	33,800	4,788	4,264	4,788	4,494
33,800	33,850	4,800	4,271	4,800	4,501
33,850	33,900	4,813	4,279	4,813	4,509
33,900	33,950	4,825	4,286	4,825	4,516
33,950	34,000	4,838	4,294	4,838	4,524

\$100 of additional income . . .

. . . results in \$25 of additional tax liability.

revenue by even a small amount. In this range, the deadweight loss of taxation in the form of reductions in gains from trade will be exceedingly large relative to the additional tax revenue. Thus, the ideal tax rate will be well below the rate that maximizes revenue.

The Laffer curve shows that it is important to distinguish between changes in tax rates and changes in tax revenues. Higher rates will not always lead to more revenue for the government. Similarly, lower rates will not always lead to less revenue. **When tax rates are already high, a rate reduction may increase tax revenues. Correspondingly, increasing high tax rates may lead to less tax revenue.**

Evidence from the sharp reduction in marginal tax rates imposed on those with high incomes during the 1980s supports the Laffer curve. The top marginal rate was reduced from 70 percent at the beginning of the decade to 33 percent by the end of the decade. Even though the top rates were cut sharply, tax revenues and the share of the personal income tax paid by high-income earners actually rose as a result. During the decade, revenue collected from the top 1 percent of earners rose a whopping 51.4 percent (after adjusting for inflation). In 1980, 19 percent of the personal income tax was collected from the top 1 percent of earners. By 1990, at the lower tax rates, the top 1 percent of earners accounted for more than

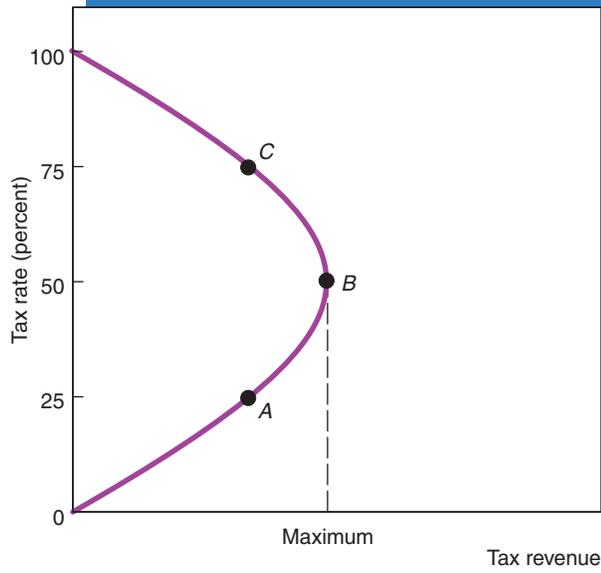


EXHIBIT 9 Laffer Curve

Because taxing an activity affects the amount of it people will do, a change in tax rates will not lead to a proportional change in tax revenues. As the Laffer curve indicates, beyond some point (B), an increase in tax rates will cause tax revenues to fall. At high tax rates, revenue can be increased by lowering tax rates. The tax rate that maximizes tax revenue is higher than the ideal tax rate for the economy as a whole because of the large dead-weight loss of taxation as tax rates increase toward point B.

APPLICATIONS IN ECONOMICS

The Laffer Curve and Mountain-Climbing Deaths

The Laffer curve can be used to illustrate many other relationships besides just tax rates and tax revenues. Economists J. R. Clark and Dwight Lee have used it to analyze the relationship between the safety of mountain climbing and mountain-climbing deaths on Mt. McKinley, North America's highest peak. As the risk of dying from climbing Mt. McKinley fell due to greater search-and-rescue efforts by national park personnel, the number of people seeking to "conquer the mountain" rose significantly. The increase in the number of climbers attempting to conquer the mountain offset the lower risk, leading to a Laffer curve-type relationship. In other words, greater search-and-rescue efforts led to a *higher* number of total deaths on the mountain.

Let's look at the problem numerically. Assume that if the probability of death from an attempted climb were 90 percent, only 100 people would attempt to climb the mountain each year, leading to an annual death rate of 90. Now suppose that greater search-and-rescue efforts lower the probability of death to 50 percent. Because incentives matter, the increased safety will result in an increase in the number of people attempting to climb the mountain.

Suppose that the number of climbers increases from 100 to 200. With 200 climbers and a 50 percent probability of death, the annual number of fatalities would increase to 100, 10 more than before rescue efforts were improved. The total number of mountain-climbing deaths is actually lowest when there is both a very high and a very low probability of death—just as the Laffer curve predicts. The number of deaths is largest in the middle probability ranges. Making a very risky mountain safer can therefore result in more rather than fewer fatalities.

Clark and Lee have also explored a similar relationship between average lengths of prison sentences and total prison space occupied. Other economists have explored the Laffer curve relationship between the minimum wage and the earnings of minimum-wage workers, as well as the regulatory costs of protecting endangered species and the habitat acres available to them.¹

¹See J. R. Clark and Dwight R. Lee, "Too Safe to Be Safe: Some Implications of Short- and Long-Run Rescue Laffer Curves," *Eastern Economic Journal*, 23 no. 2 (Spring 1997): 127–37; Russell S. Sobel, "Theory and Evidence on the Political Economy of the Minimum Wage," *Journal of Political Economy*, 107 no. 4 (August 1999): 761–85; and Richard L. Stroup, "The Endangered Species Act: The Laffer Curve Strikes Again," *The Journal of Private Enterprise*, vol. XIV (Special Issue 1998): 48–62.

25 percent of income tax revenues. The top 10 percent of earners paid just over 49 percent of total income taxes in 1980, but by 1990 the share paid by these earners had risen to 55 percent. Thus, the reduction in the exceedingly high rates increased the revenue collected from high-income taxpayers. Additional evidence on the impact of these tax changes in the 1980s is provided in Special Topic 1. However, recently proposals have been made to significantly increase marginal tax rates back to the levels from the early 1990s or even higher, and it will be interesting to see what happens to tax revenue from the rich as a result.

The Impact of a Subsidy

Subsidy

A payment the government makes to either the buyer or seller, usually on a per-unit basis, when a good or service is purchased or sold.

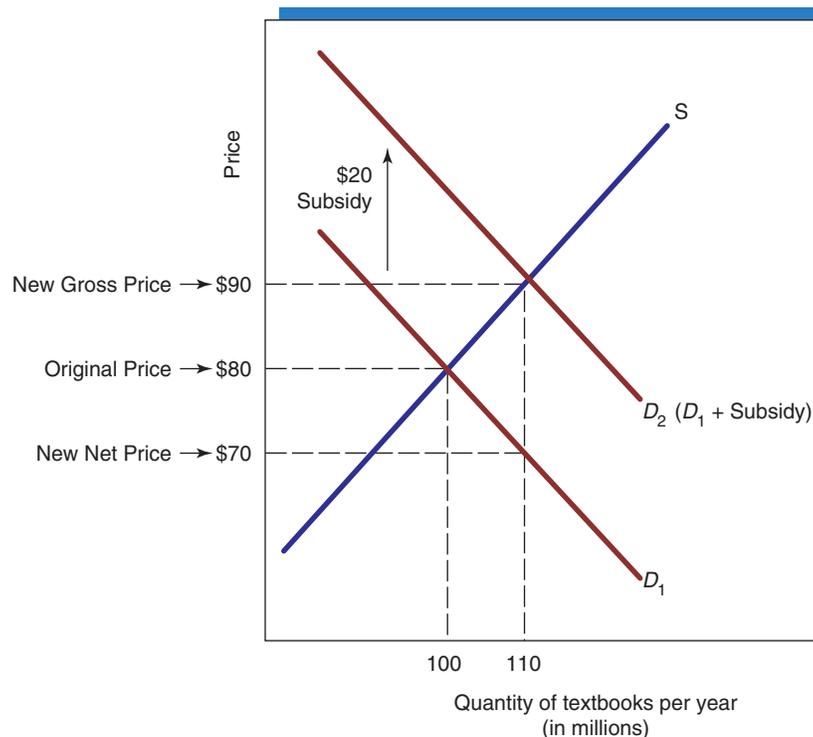
The supply and demand framework can also be used to analyze the impact of a government **subsidy**. A subsidy is a payment to either the buyer or seller of a good or service, usually on a per-unit basis. Subsidies are often granted in an effort to help buyers afford a good or service, or to increase the profitability of producers in an industry. As we have seen in other cases, however, the effect of a government program often differs substantially from its original intent. Because prices change when subsidies are imposed (just as when taxes are imposed), the benefit of a subsidy can be partially, or totally, shifted from buyer to seller, or vice versa.

Suppose that the government, in an effort to make textbooks more affordable, gives college students (buyers) a \$20 subsidy for each book they buy. **EXHIBIT 10** shows the effect of the program. Before the subsidy was instituted, 100 million textbooks were sold each year at an average price of \$80 per book. The \$20-per-book subsidy paid to the buyers will increase demand by the amount of the subsidy (shift from D_1 to D_2). As the result of the subsidy, the equilibrium price will increase from \$80 to \$90, and the total quantity purchased will expand to 110 million textbooks per year.

The subsidy program reduces the students' out-of-pocket cost of a textbook (from \$80 to \$70), but the net gain to them is less than the amount of the subsidy. Why? Even though the textbook subsidy is granted to buyers, substantial benefits also accrue to sellers. Because the subsidy program increases the demand for textbooks, pushing their price

EXHIBIT 10 The Impact of a Subsidy Granted to Buyers

When a \$20-per-textbook subsidy is given to students, the demand curve for textbooks shifts vertically upward by the amount of the subsidy. The market price of textbooks rises from \$80 to \$90 (new gross price). With the \$20 subsidy, buyers now pay a net price of \$70 per textbook (the new \$90 price minus the \$20 subsidy), which is \$10 less than before. Textbook buyers get only \$10 of the benefit of the subsidy; the remaining \$10 benefit accrues to the supply side of the market (sellers and resource suppliers) in the form of higher textbook prices. The distribution of the benefit from the subsidy between buyers and sellers would be the same, whether it was granted to buyers or sellers.



upward by \$10, half of the benefits are captured by sellers (including resource suppliers like copy editors, authors, and paper suppliers).

Alternatively, if textbook suppliers had been granted a \$20 payment from the government for each textbook sold, the supply curve would have shifted downward by the amount of the subsidy. This would cause the market price of textbooks to decline to \$70. In this case, buyers pay \$10 less than before the subsidy program, while the sellers receive \$10 more (the sellers now get \$90 for each book sold—the \$70 market price plus the \$20 government subsidy). Just like a tax, a subsidy results in the same outcome, regardless of whether the subsidy is granted to buyers or sellers.

Elasticity and the Benefit of Government Subsidy Programs

In this example, the benefit of the \$20-per-textbook subsidy was split evenly between buyers and sellers. However, the actual distribution of this benefit will depend on the elasticities of supply and demand—just as it does with a tax. The greater share of the benefit of a subsidy will always be shifted toward the more inelastic side of the market. Thus, the more inelastic the supply, the larger the share of the benefit that will accrue to sellers. Conversely, the more inelastic the demand, the larger the share of the benefit that will accrue to buyers. Using our earlier examples from the section on taxation, consumers would be the main beneficiary of a subsidy on gasoline (a good for which the demand is relatively inelastic, and supply elastic), while suppliers would be the main beneficiary of a subsidy on luxury boats (a good for which demand is relatively elastic, and supply inelastic). Economic analysis indicates that the true benefit of a subsidy will (1) be the same regardless of whether the subsidy is granted to the buyers or sellers in a market, and (2) will depend on the elasticities of supply and demand.

The Cost of Government Subsidy Programs

Policy makers and citizens alike often complain that the cost of government subsidy programs almost invariably exceeds initial projections. One reason for this is the increase in the quantity of the good purchased resulting from the subsidy. Prior to the enactment of the textbook subsidy, 100 million textbooks were sold annually. With a subsidy of \$20 per textbook, one might be inclined to think that the annual cost of the program will be \$2 billion ($\20×100 million). This figure, however, will underestimate the true cost. Once the subsidy is in place, textbook sales will increase to 110 million, driving the overall cost of the program up to \$2.2 billion ($\20×110 million).

Furthermore, the expenditures on the subsidies will understate their total costs. To finance the subsidies, the government will have to raise the funds through taxation. A new subsidy granted in one market will require greater taxation in other markets. As we have previously discussed, the taxes will generate a deadweight loss over and above the revenues transferred to the government. This excess burden is also a cost of the subsidy payments.

Real-World Subsidy Programs

The United States has a vast array of subsidy programs. Spending on these programs and the taxes that finance them are major items in the government budget. Some subsidy programs, such as Medicare and food stamps, provide payments to buyers. Others, such as the subsidies to the arts, public broadcasting, sports stadiums, and ethanol are directed toward suppliers. As we discussed, however, the party granted the subsidy may not be the one who captures the larger share of the actual benefit from the subsidy.

Still other subsidy programs are combined with price controls. Many agriculture subsidies fall into this category. The government fixes the prices of products like wheat, corn, cotton, and tobacco above the market equilibrium. To maintain the above-equilibrium price, the government purchases any amount produced that cannot be sold at the artificially high price. The government also restricts the acreage farmers are permitted to plant for

these crops. If it were not for the planting restrictions, huge surpluses of these products would develop.

Sometimes government subsidies are granted only to a select group, or subset, of buyers (or sellers). Consider the structure of healthcare subsidies in the United States. The Medicare program subsidizes the healthcare purchases of senior citizens, and the Medicaid program provides subsidies to low-income households. These subsidies increase the demand for health care and drive up the prices of medical service for all consumers, including those ineligible for either program. When only some of the buyers in a market are subsidized, groups that are ineligible for the subsidies will generally be harmed because they will have to pay higher prices for the good or service than they would otherwise have to, even though they do not receive a subsidy.

Ethanol, a biofuel alternative to gasoline made from corn, provides another example of a product that is heavily subsidized in the United States. Ethanol subsidies, which amount to approximately \$1.25 per gallon, have a direct cost to taxpayers of almost \$6 billion per year. Ethanol is significantly more costly to produce than gasoline. In effect, the ethanol subsidies channel resources into production of a good that is valued less than its production cost. Ethanol's environmental benefits over gasoline are highly questionable. Why does the government subsidize ethanol? The ethanol subsidies increase the demand for corn, driving up its price. Corn farmers derive major benefits from the program, while the cost is spread thinly across taxpayers (who fund the subsidies) and consumers (who pay higher prices for the many products made from corn—from tortillas to soft drinks). As we will discuss later, politicians can derive political gain by supporting programs of this type even when the programs are inefficient. Further, the largest corn-producing state is Iowa, which also happens to hold early caucuses and elect the first delegates to the presidential nominating conventions. Like many other subsidies, the ethanol program is driven by political forces rather than sound economics.

Subsidy programs are often highly complex, and it is sometimes difficult to determine whom they really benefit. As we proceed, we will analyze several of these programs in more detail. The supply and demand model presented here will facilitate our analysis.

Looking ahead

This chapter focused on how government-mandated price controls, taxes, subsidies, and prohibitions affect market outcomes. The next two chapters will apply the basic tools of economics to the political process more generally. In the chapters that follow, we will consider when intervention by the government is likely to enhance the well-being of citizens, and when it is likely to make them worse off. We will also analyze how the political process works and explain why it is sometimes a source of economic inefficiency.



KEY POINTS

- ▼ Resource markets and product markets are closely linked. A change in one will generally result in changes in the other.
- ▼ Legally imposed price ceilings result in shortages, and legally imposed price floors will cause surpluses. Both also cause other harmful secondary effects. Rent controls, for example, will lead to shortages, less investment, poor maintenance, and deterioration in the quality of rental housing.
- ▼ The minimum wage is a price floor for low-skilled labor. It increases the earnings of some low-skilled workers but also reduces employment and leads to fewer training opportunities and nonwage job benefits for other low-skilled workers.

- ▼ Because black markets operate outside the legal system, they are often characterized by deception, fraud, and the use of violence as a means of enforcing contracts. A legal system that provides secure private-property rights and unbiased enforcement of contracts enhances the operation of markets.
- ▼ The division of the actual tax burden between buyers and sellers is determined by the relative elasticities of demand and supply rather than on whom the tax is legally imposed.
- ▼ In addition to the cost of the tax revenue transferred to the government, taxes will reduce the level of the activity taxed, eliminate some gains from trade, and thereby impose an excess burden, or deadweight loss.
- ▼ As tax rates increase, the size of the tax base will shrink. Initially, rates and revenues will be directly related—revenues will expand as rates increase. However, as higher and higher rates are imposed, eventually an inverse relationship will develop—revenues will decline as rates are increased further. The Laffer curve illustrates this pattern.
- ▼ The division of the benefit from a subsidy is determined by the relative elasticities of demand and supply rather than to whom the subsidy is actually paid.



CRITICAL ANALYSIS QUESTIONS

- *1. How will a substantial increase in demand for housing affect the wages and employment of carpenters, plumbers, and electricians?
2. Suppose that college students in your town persuaded the town council to enact a law setting the maximum price for rental housing at \$400 per month. Will this help or hurt college students who rent housing? In your answer, address how this price ceiling will affect (a) the quality of rental housing; (b) the amount of rental housing available; (c) the incentive of landlords to maintain their properties; (d) the amount of racial, gender, and other types of discrimination in the local rental housing market; (e) the ease with which students will be able to find housing, and, finally; (f) whether a black market for housing would develop.
3. What is the difference between a price ceiling and a price floor? What will happen if a price ceiling is imposed below the market equilibrium? If a price ceiling for a good is set below the market equilibrium, what will happen to the quality and future availability of the good? Explain.
- *4. To be meaningful, a price ceiling must be below the market price. Conversely, a meaningful price floor must be above the market price. What impact will a meaningful price ceiling have on the quantity exchanged? What impact will a meaningful price floor have on the quantity exchanged? Explain.
5. Congress recently passed a new program that will subsidize the purchase of prescription drugs by the elderly. What impact will this program have on the demand for and price of prescription drugs? How will people who are not elderly be affected by this program? Explain.
- *6. Analyze the impact of an increase in the minimum wage from the current level to \$10 per hour. How would the following be affected?
 - a. employment of people previously earning less than \$10 per hour
 - b. the unemployment rate of teenagers
 - c. the availability of on-the-job training for low-skilled workers
 - d. the demand for high-skilled workers who are good substitutes for low-skilled workers
7. What is a black market? What are some of the main differences in how black markets operate relative to legal markets?
8. How do you think the markets for organ donation and child adoption would be affected if they were made fully legal with a well-functioning price mechanism? What would be the advantages and disadvantages relative to the current system?
9. What is meant by the incidence of a tax? Explain why the statutory and actual incidence of a tax can be different.
10. What conditions must be met for buyers to bear the full burden of a tax? What conditions would cause sellers to bear the full burden? Explain.
- *11. What is the nature of the deadweight loss accompanying taxes? Why is it often referred to as an “excess burden”?
12. The demand and supply schedules for a hypothetical labor market are given in the accompanying table.
 - a. Find the equilibrium wage and number of workers hired.

- b. Suppose that a new law is passed requiring employers to pay an unemployment insurance tax of \$1.50 per hour for every employee. What happens to the equilibrium wage rate and number of workers hired? How is this tax burden distributed between employers and workers?
- c. Now suppose that rather than being paid by employers, the tax must be paid by workers. How does this affect the equilibrium wage rate and number of workers hired? How is this tax burden distributed between employers and workers?
- d. Does it make a difference who is statutorily liable for the tax?

Demand		Supply	
Wage	Quantity Demanded	Wage	Quantity Supplied
\$10.00	1,000	\$10.00	1,900
9.50	1,200	9.50	1,800
9.00	1,400	9.00	1,700
8.50	1,600	8.50	1,600
8.00	1,800	8.00	1,500
7.50	2,000	7.50	1,400

- 13. Currently, the Social Security payroll tax is legally imposed equally on workers and employers: 7.65 percent for employees and 7.65 percent for employers. Show this graphically, being careful to distinguish between the total cost to the employer of hiring a worker, the employee’s gross wage, and the employee’s net wage. Show how the outcome would differ if all 15.3 percent were

imposed on the employee or if all 15.3 percent were imposed on the employer.

- *14. Suppose Congress were to pass legislation requiring that businesses employing workers with three or more children pay these employees at least \$15 per hour. How would this legislation affect the employment level of low-skilled workers with three or more children? Do you think some workers with large families might attempt to conceal the fact? Why?
- 15. “We should impose a 20 percent luxury tax on expensive automobiles (those with a sales price of \$50,000 or more) in order to collect more tax revenue from the wealthy.” Will the burden of the proposed tax fall primarily on the wealthy? Why or why not?
- *16. Should policy makers seek to set the tax on an economic activity at a rate that will maximize the revenue derived from the tax? Why or why not? Explain.
- *17. During the summer of 2001, the combination of city and state taxes on cigarettes sold in New York City rose from \$1.19 to more than \$3.00 per pack. How will this tax increase affect (a) the quantity of cigarettes sold in New York City, (b) the revenue derived by the city and state from the tax, (c) the Internet purchases of cigarettes by New Yorkers, and (d) the incidence of smoking by New Yorkers?

*Asterisk denotes questions for which answers are given in Appendix B.