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task each person is doing. Your partner does the dishes, mows the lawn, and makes the grocery list. You do the cooking, laundry, shopping, cleaning, and paying the bills. This may seem imbalanced, but when you look at it, you see that by the time your partner gets to the grocery-list task, he is wearing thin and starting to nod off. It's all he can do to figure out how much milk you need. In fact, he is just about as good at that as you are when you get around to paying the bills, even though that's your fifth task.

If you then made your partner also do the cleaning—so it was an even four and four—the house would be a disaster, since he is already exhausted by his third chore while you are still doing fine. This system may well end up meaning one person does more, but it is unlikely to result in one person doing everything.

Once you've decided you need to divide up the chores in this way, how should you decide who does what? One option would be randomly assigning tasks; another would be having each person do some of everything. One spousal-advice website I read suggested you should divide tasks based on which ones you like the best. None of these are quite right. (In the last case, how would anyone ever end up with the job of cleaning the bathroom?)

To decide who does what, we need more economics. Specifically, the principle of comparative advantage. Economists usually talk about this in the context of trade. Imagine Finland is better than Sweden at making both reindeer hats and snowshoes. But they are much, much better at the hats and only a little better at the snowshoes. The overall world production is maximized when Finland makes hats and Sweden makes snowshoes.

We say that Finland has an *absolute advantage* in both things but a *comparative advantage* only in hats. This principle is part of the reason economists value free trade, but that's for another column (and probably another author). But it's also a guideline for how to trade tasks in your house. You want to assign each person the tasks on which he or she has a comparative advantage. It doesn't matter that you have an absolute advantage in everything. If you are much, much better at the laundry and only a little better at cleaning the toilet, you should do the laundry and have your spouse get out the scrub brush. Just explain that it's efficient!



In our case, it was easy. Other than using the grill—which I freely admit is the husband domain—I'm much, much better at cooking. And I was only moderately better at the dishes. So he got the job of cleaning up after meals, even though his dishwasher loading habits had already come under scrutiny. The good news is another economic principle I hadn't even counted on was soon in play: *learning by doing*. As people do a task, they improve at it. Eighteen months into this new arrangement the dishwasher is almost a work of art: neat rows of dishes and everything carefully screened for “top-rack

only” status. I, meanwhile, am forbidden from getting near the dishwasher. Apparently, there is a risk that I’ll “ruin it.”

Ms. Oster is a professor of economics at the University of Chicago. 

Source: *Slate*, November 21, 2012. The article is found in the link:
http://www.slate.com/articles/double_x/doublex/2012/11/dividing_the_chores_who_should_cook_and_who_should_clean.2.html

In this example, Brady has an absolute advantage in mowing lawns because he can do the work with a lower input of time. Yet because Brady's opportunity cost of mowing the lawn is \$20,000 and Gump's opportunity cost is only \$40, Gump has a comparative advantage in mowing lawns.

The gains from trade in this example are tremendous. Rather than mowing his own lawn, Brady should make the commercial and hire Gump to mow the lawn. As long as Brady pays Gump more than \$40 and less than \$20,000, both of them are better off.

3-3b Should the United States Trade with Other Countries?

Just as individuals can benefit from specialization and trade with one another, as Frank and Rose did, so can populations of people in different countries. Many of the goods that Americans enjoy are produced abroad, and many of the goods produced in the United States are sold abroad. Goods produced abroad and sold domestically are called **imports**. Goods produced domestically and sold abroad are called **exports**.

imports goods produced abroad and sold domestically

exports goods produced domestically and sold abroad

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To see how countries can benefit from trade, suppose there are two countries, the United States and Japan, and two goods, food and cars. Imagine that the two countries produce cars equally well: An American worker and a Japanese worker can each produce one car per month. By contrast, because the United States has more and better land, it is better at producing food: A U.S. worker can produce 2 tons of food per month, whereas a Japanese worker can produce only 1 ton of food per month.

The principle of comparative advantage states that each good should be produced by the country that has the smaller opportunity cost of producing that good. Because the opportunity cost of a car is 2 tons of food in the United States but only 1 ton of food in Japan, Japan has a comparative advantage in producing cars. Japan should produce more cars than it wants for its own use and export some of them to the United States. Similarly, because the opportunity cost of a ton of food is 1 car in Japan but only $\frac{1}{2}$ car in the United States, the United States has a comparative advantage in producing food. The United States should produce more food than it wants to consume and export some to Japan. Through specialization and trade, both countries can have more food and more cars.

In reality, of course, the issues involved in trade among nations are more complex than this example suggests. Most important among these issues is that each country has many citizens with different interests. International trade can make some individuals worse off, even as it makes the country as a whole better off. When the United States exports food and imports cars, the impact on an American farmer is not the same as the impact on an American autoworker. Yet, contrary to the opinions sometimes voiced by politicians and pundits, international trade is not like war, in which some countries win and others lose. Trade allows all countries to achieve greater prosperity.

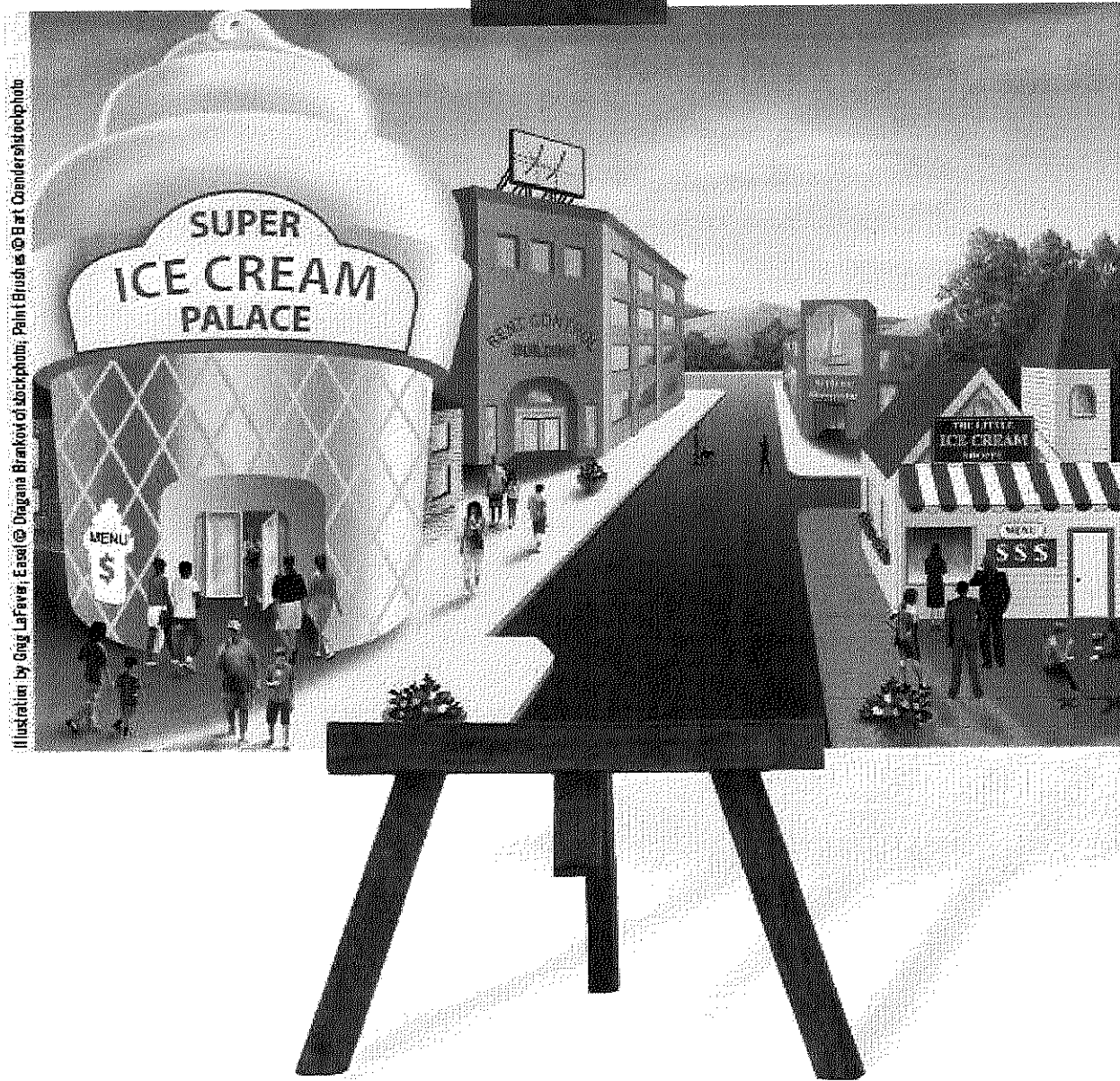
Quick Quiz *Suppose that a skilled brain surgeon also happens to be the world's fastest typist. Should she do her own typing or hire a secretary? Explain.*

3-4 Conclusion

You should now understand more fully the benefits of living in an interdependent economy. When Americans buy tube socks from China, when residents of Maine drink orange juice from Florida, and when a homeowner hires the kid next door to mow the lawn, the same economic forces are at work. The principle of comparative advantage shows that trade can make everyone better off.

Having seen why interdependence is desirable, you might naturally ask how it is possible. How do free societies coordinate the diverse activities of all the people involved in their economies? What ensures that goods and services will get from those who should be producing them to those who should be consuming them? In a world with only two people, such as Rose the rancher and Frank the farmer, the answer is simple: These two people can bargain and allocate resources between themselves. In the real world with billions of people, the answer is less obvious. We take up this issue in Chapter 4, where we see that free societies allocate resources through the market forces of supply and demand.

Summary



When a cold snap hits Florida, the price of orange juice rises in supermarkets throughout the country. When the weather turns warm in New England every summer, the price of hotel rooms in the Caribbean plummets. When a war breaks out in the Middle East, the price of gasoline in the United States rises and the price of a used Cadillac falls. What do these events have in common? They all show the workings of supply and demand.

Supply and *demand* are the two words economists use most often—and for good reason. Supply and demand are the forces that make market economies work. They determine the quantity of each good produced and the price at which it is sold. If you want to know how any event or policy will affect the economy, you must think first about how it will affect supply and demand.

This chapter introduces the theory of supply and demand. It considers how buyers and sellers behave and how they interact with one another.

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It shows how supply and demand determine prices in a market economy and how prices, in turn, allocate the economy's scarce resources.

4-1 Markets and Competition

The terms *supply* and *demand* refer to the behavior of people as they interact with one another in competitive markets. Before discussing how buyers and sellers behave, let's first consider more fully what we mean by the terms *market* and *competition*.

4-1a What Is a Market?

A **market** is a group of buyers and sellers of a particular good or service. The buyers as a group determine the demand for the product, and the sellers as a group determine the supply of the product.

market a group of buyers and sellers of a particular good or service

Markets take many forms. Some markets are highly organized, such as the markets for many agricultural commodities. In these markets, buyers and sellers meet at a specific time and place where an auctioneer helps set prices and arrange sales.

More often, markets are less organized. For example, consider the market for ice cream in a particular town. Buyers of ice cream do not meet together at any one time. The sellers of ice cream are in different locations and offer somewhat different products. There is no auctioneer calling out the price of ice cream. Each seller posts a price for an ice-cream cone, and each buyer decides how much ice cream to buy at each store. Nonetheless, these consumers and producers of ice cream are closely connected. The ice-cream buyers are choosing from the various ice-cream sellers to satisfy their cravings, and the ice-cream sellers are all trying to appeal to the same ice-cream buyers to make their businesses successful. Even though it is not as organized, the group of ice-cream buyers and ice-cream sellers forms a market.

4-1b What Is Competition?

The market for ice cream, like most markets in the economy, is highly competitive. Each buyer knows that there are several sellers from which to choose, and each seller is aware that his product is similar to that offered by other sellers. As a result, the price and quantity of ice cream sold are not determined by any single buyer or seller. Rather, price and quantity are determined by all buyers and sellers as they interact in the marketplace.

Economists use the term **competitive market** to describe a market in which there are so many buyers and so many sellers that each has a negligible impact on the market price. Each seller of ice cream has limited control over the price because other sellers are offering similar products. A seller has little reason to charge less than the going price, and if he charges more, buyers will make their purchases elsewhere. Similarly, no single buyer of ice cream can influence the price of ice cream because each buyer purchases only a small amount.

competitive market a market in which there are many buyers and many sellers so that each has a negligible impact on the market price

In this chapter, we assume that markets are *perfectly competitive*. To reach this highest form of competition, a market must have two characteristics: (1) The goods offered for sale are all exactly the same, and (2) the buyers and sellers are so numerous that no single buyer or seller has any influence over the market price. Because buyers and sellers in perfectly competitive markets must accept the price the

market determines, they are said to be *price takers*. At the market price, buyers can buy all they want, and sellers can sell all they want.

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There are some markets in which the assumption of perfect competition applies perfectly. In the wheat market, for example, there are thousands of farmers who sell wheat and millions of consumers who use wheat and wheat products. Because no single buyer or seller can influence the price of wheat, each takes the market price as given.

Not all goods and services, however, are sold in perfectly competitive markets. Some markets have only one seller, and this seller sets the price. Such a seller is called a *monopoly*. Your local cable television company, for instance, may be a monopoly. Residents of your town probably have only one company from which to buy cable service. Still other markets fall between the extremes of perfect competition and monopoly.

Despite the diversity of market types we find in the world, assuming perfect competition is a useful simplification and, therefore, a natural place to start. Perfectly competitive markets are the easiest to analyze because everyone participating in the market takes the price as given by market conditions. Moreover, because some degree of competition is present in most markets, many of the lessons that we learn by studying supply and demand under perfect competition apply in more complicated markets as well.

Quick Quiz *What is a market? • What are the characteristics of a perfectly competitive market?*

4-2 Demand

We begin our study of markets by examining the behavior of buyers. To focus our thinking, let's keep in mind a particular good—ice cream.

4-2a The Demand Curve: The Relationship between Price and Quantity Demanded

The **quantity demanded** of any good is the amount of the good that buyers are willing and able to purchase. As we will see, many things determine the quantity demanded of any good, but in our analysis of how markets work, one determinant plays a central role—the price of the good. If the price of ice cream rose to \$20 per scoop, you would buy less ice cream. You might buy frozen yogurt instead. If the price of ice cream fell to \$0.20 per scoop, you would buy more. This relationship between price and quantity demanded is true for most goods in the economy and, in fact, is so pervasive that economists call it the **law of demand**: Other things being equal, when the price of a good rises, the quantity demanded of the good falls, and when the price falls, the quantity demanded rises.

quantity demanded *the amount of a good that buyers are willing and able to purchase*

law of demand *the claim that, other things being equal, the quantity demanded of a good falls when the price of the good rises*

The table in Figure 1 shows how many ice-cream cones Catherine buys each month at different prices of ice cream. If ice cream is free, Catherine eats 12 cones per month. At \$0.50 per cone, Catherine buys 10 cones each month. As the price rises further, she buys fewer and fewer cones. When the price reaches \$3.00, Catherine doesn't buy any cones at all. This table is a **demand schedule**, a table that shows the relationship between the price of a good and the quantity demanded, holding constant everything else that influences how much of the good consumers want to buy.

demand schedule *a table that shows the relationship between the price of a good and the quantity demanded*

The graph in Figure 1 uses the numbers from the table to illustrate the law of demand. By convention, the price of ice cream is on the vertical axis, and the quantity of ice cream demanded is on the horizontal axis. The line relating price and quantity demanded is called the **demand curve**. The demand curve slopes downward because, other things being equal, a lower price means a greater quantity demanded.

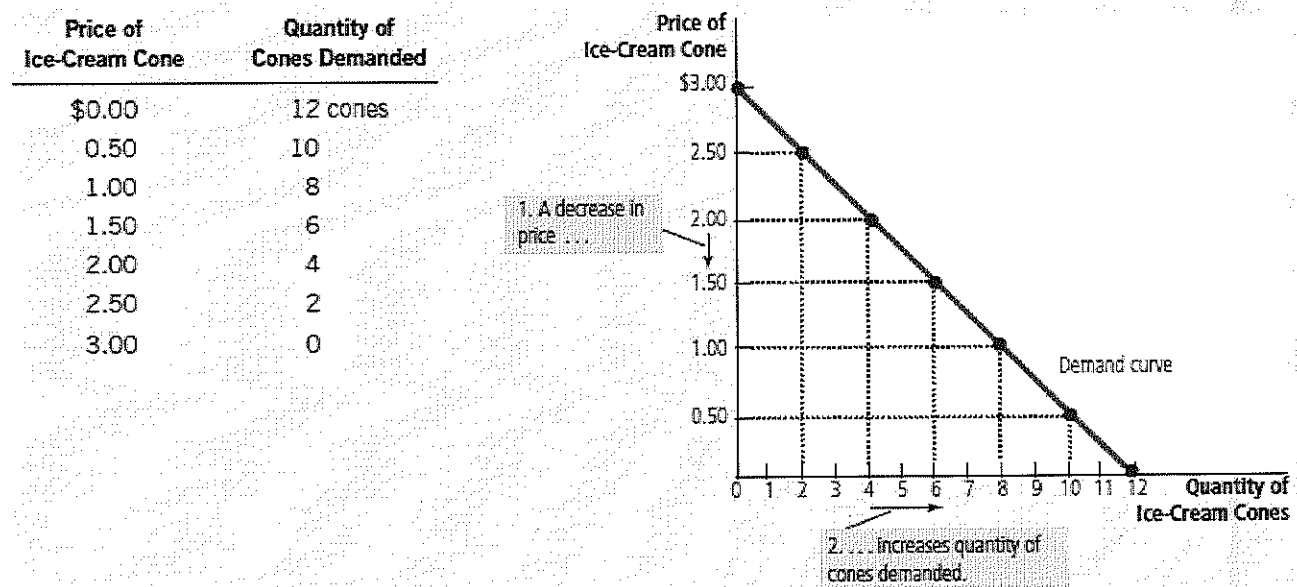
demand curve *a graph of the relationship between the price of a good and the quantity demanded*

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FIGURE 1

Catherine's Demand Schedule and Demand Curve

The demand schedule is a table that shows the quantity demanded at each price. The demand curve, which graphs the demand schedule, illustrates how the quantity demanded of the good changes as its price varies. Because a lower price increases the quantity demanded, the demand curve slopes downward.



4-2b Market Demand versus Individual Demand

The demand curve in Figure 1 shows an individual's demand for a product. To analyze how markets work, we need to determine the *market demand*, the sum of all the individual demands for a particular good or service.

The table in Figure 2 shows the demand schedules for ice cream of the two individuals in this market—Catherine and Nicholas. At any price, Catherine's demand schedule tells us how much ice cream she buys, and Nicholas's demand schedule tells us how much ice cream he buys. The market demand at each price is the sum of the two individual demands.

The graph in Figure 2 shows the demand curves that correspond to these demand schedules. Notice that we sum the individual demand curves horizontally to obtain the market demand curve. That is, to find the total quantity demanded at any price, we add the individual quantities, which are found on the horizontal axis of the individual demand curves. Because we are interested in analyzing how markets function, we work most often with the market demand curve. The market demand curve shows how the total quantity demanded of a good varies as the price of the good varies, while all the other factors that affect how much consumers want to buy are held constant.

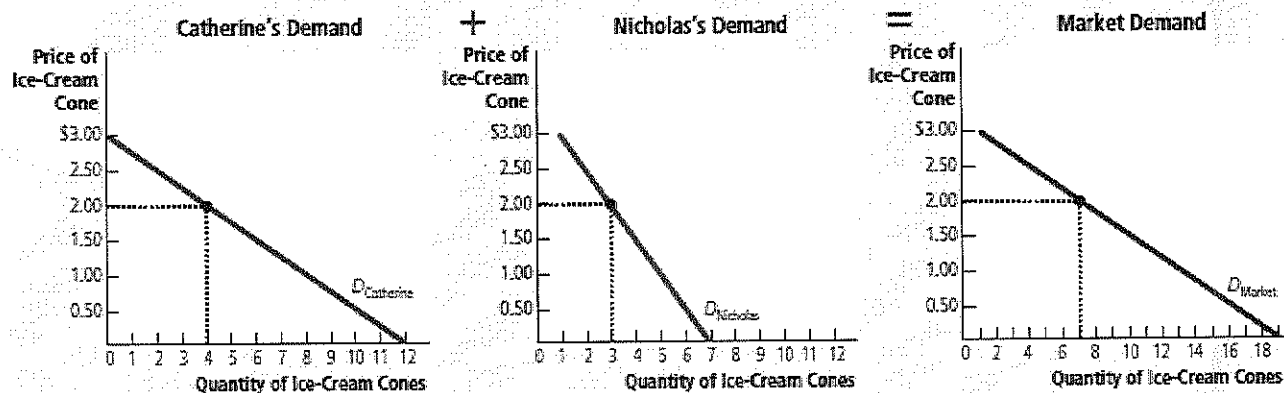
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FIGURE 2

Market Demand as the Sum of Individual Demands

The quantity demanded in a market is the sum of the quantities demanded by all the buyers at each price. Thus, the market demand curve is found by adding horizontally the individual demand curves. At a price of \$2.00, Catherine demands 4 ice-cream cones and Nicholas demands 3 ice-cream cones. The quantity demanded in the market at this price is 7 cones.

Price of Ice-Cream Cone	Catherine		Nicholas		Market
\$0.00	12	+	7	=	19 cones
0.50	10		6		16
1.00	8		5		13
1.50	6		4		10
2.00	4		3		7
2.50	2		2		4
3.00	0		1		1



4-2c Shifts in the Demand Curve

Because the market demand curve holds other things constant, it need not be stable over time. If something happens to alter the quantity demanded at any given price, the demand curve shifts. For example, suppose the American Medical Association discovered that people who regularly eat ice cream live longer, healthier lives. The discovery would raise the demand for ice cream. At any given price, buyers would now want to purchase a larger quantity of ice cream, and the demand curve for ice cream would shift.

Figure 3 illustrates shifts in demand. Any change that increases the quantity demanded at every price, such as our imaginary discovery by the American Medical Association, shifts the demand curve to the right and is called an *increase in demand*. Any change that reduces the quantity demanded at every price shifts the demand curve to the left and is called a *decrease in demand*.

There are many variables that can shift the demand curve. Here are the most important.

Income What would happen to your demand for ice cream if you lost your job one summer? Most likely, it would fall. A lower income means that you have less to spend in total, so you would have to

spend less on some—and probably most—goods. If the demand for a good falls when income falls, the good is called a **normal good**.

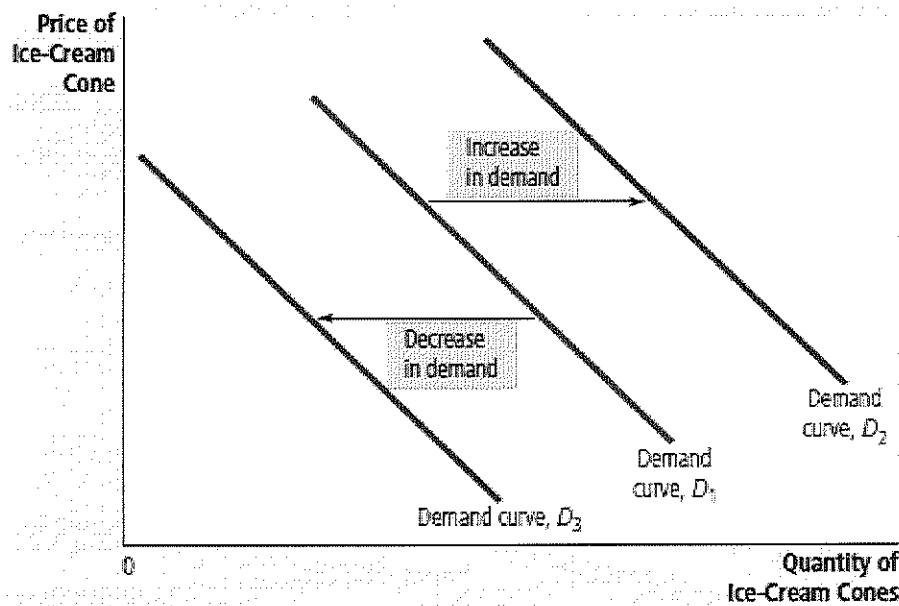
normal good *a good for which, other things being equal, an increase in income leads to an increase in demand*

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FIGURE 3

Shifts in the Demand Curve

Any change that raises the quantity that buyers wish to purchase at any given price shifts the demand curve to the right. Any change that lowers the quantity that buyers wish to purchase at any given price shifts the demand curve to the left.



Not all goods are normal goods. If the demand for a good rises when income falls, the good is called an **inferior good**. An example of an inferior good might be bus rides. As your income falls, you are less likely to buy a car or take a cab and more likely to ride a bus.

inferior good a good for which, other things being equal, an increase in income leads to a decrease in demand

Prices of Related Goods Suppose that the price of frozen yogurt falls. The law of demand says that you will buy more frozen yogurt. At the same time, you will probably buy less ice cream. Because ice cream and frozen yogurt are both cold, sweet, creamy desserts, they satisfy similar desires. When a fall in the price of one good reduces the demand for another good, the two goods are called **substitutes**. Substitutes are often pairs of goods that are used in place of each other, such as hot dogs and hamburgers, sweaters and sweatshirts, and movie tickets and DVD rentals.

substitutes two goods for which an increase in the price of one leads to an increase in the demand for the other

Now suppose that the price of hot fudge falls. According to the law of demand, you will buy more hot fudge. Yet in this case, you will likely buy more ice cream as well because ice cream and hot fudge are often used together. When a fall in the price of one good raises the demand for another good, the two goods are called **complements**. Complements are often pairs of goods that are used together, such as gasoline and automobiles, computers and software, and peanut butter and jelly.

complements *two goods for which an increase in the price of one leads to a decrease in the demand for the other*

Tastes The most obvious determinant of your demand is your tastes. If you like ice cream, you buy more of it. Economists normally do not try to explain people's tastes because tastes are based on historical and psychological forces that are beyond the realm of economics. Economists do, however, examine what happens when tastes change.

Expectations Your expectations about the future may affect your demand for a good or service today. If you expect to earn a higher income next month, you may

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choose to save less now and spend more of your current income buying ice cream. If you expect the price of ice cream to fall tomorrow, you may be less willing to buy an ice-cream cone at today's price.

Number of Buyers In addition to the preceding factors, which influence the behavior of individual buyers, market demand depends on the number of these buyers. If Peter were to join Catherine and Nicholas as another consumer of ice cream, the quantity demanded in the market would be higher at every price, and market demand would increase.

Summary The demand curve shows what happens to the quantity demanded of a good when its price varies, holding constant all the other variables that influence buyers. When one of these other variables changes, the demand curve shifts. Table 1 lists the variables that influence how much of a good consumers choose to buy.

If you have trouble remembering whether you need to shift or move along the demand curve, it helps to recall a lesson from the appendix to Chapter 2. A curve shifts when there is a change in a relevant variable that is not measured on either axis. Because the price is on the vertical axis, a change in price represents a movement along the demand curve. By contrast, income, the prices of related goods, tastes, expectations, and the number of buyers are not measured on either axis, so a change in one of these variables shifts the demand curve.

TABLE 1

Variables That Influence Buyers

This table lists the variables that affect how much consumers choose to buy of any good. Notice the special role that the price of the good plays: A change in the good's price represents a movement along the demand curve, whereas a change in one of the other variables shifts the demand curve.

Variable	A Change in This Variable...
Price of the good itself	Represents a movement along the demand curve
Income	Shifts the demand curve
Prices of related goods	Shifts the demand curve
Tastes	Shifts the demand curve
Expectations	Shifts the demand curve
Number of buyers	Shifts the demand curve

case study Two Ways to Reduce the Quantity of Smoking Demanded

Public policymakers often want to reduce the amount that people smoke because of smoking's adverse health effects. There are two ways that policy can attempt to achieve this goal.

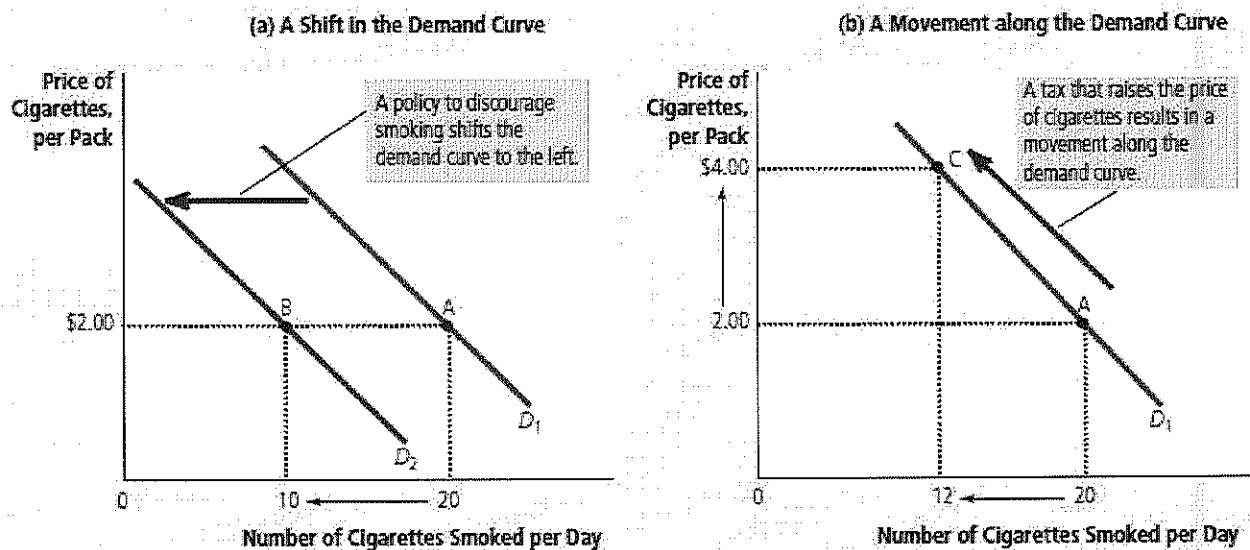
One way to reduce smoking is to shift the demand curve for cigarettes and other tobacco products. Public service announcements, mandatory health warnings on cigarette packages, and the prohibition of cigarette advertising on television are all policies aimed at reducing the quantity of cigarettes demanded at any given price. If successful, these policies shift the demand curve for cigarettes to the left, as in panel (a) of Figure 4.

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FIGURE 4

Shifts in the Demand Curve versus Movements along the Demand Curve

If warnings on cigarette packages convince smokers to smoke less, the demand curve for cigarettes shifts to the left. In panel (a), the demand curve shifts from D_1 to D_2 . At a price of \$2.00 per pack, the quantity demanded falls from 20 to 10 cigarettes per day, as reflected by the shift from point A to point B. By contrast, if a tax raises the price of cigarettes, the demand curve does not shift. Instead, we observe a movement to a different point on the demand curve. In panel (b), when the price rises from \$2.00 to \$4.00, the quantity demanded falls from 20 to 12 cigarettes per day, as reflected by the movement from point A to point C.

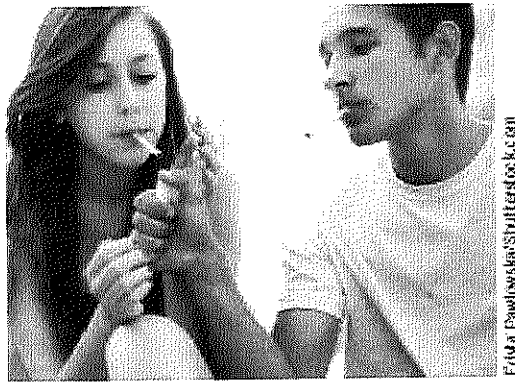


Alternatively, policymakers can try to raise the price of cigarettes. If the government taxes the manufacture of cigarettes, for example, cigarette companies pass much of this tax on to consumers in the form of higher prices. A higher price encourages smokers to reduce the numbers of cigarettes they smoke. In this case, the reduced amount of smoking does not represent a shift in the demand curve. Instead, it represents a movement along the same demand curve to a point with a higher price and lower quantity, as in panel (b) of Figure 4.

How much does the amount of smoking respond to changes in the price of cigarettes? Economists have attempted to answer this question by studying what happens when the tax on cigarettes changes. They have found that a 10 percent increase in the price causes a 4 percent reduction in the quantity demanded. Teenagers are especially sensitive to the price of cigarettes: A 10 percent increase in the price causes a 12 percent drop in teenage smoking.

A related question is how the price of cigarettes affects the demand for illicit drugs, such as marijuana. Opponents of cigarette taxes often argue that tobacco and marijuana are substitutes so that high cigarette prices encourage marijuana use. By contrast, many experts on substance abuse view tobacco as a "gateway drug" leading the young to experiment with other harmful substances. Most studies of the data are consistent with this latter view: They find that lower cigarette prices are associated with greater use of marijuana. In other words, tobacco and marijuana appear to be complements rather than substitutes. ▀

“What is the best way to stop this?”



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Quick Quiz *Make up an example of a monthly demand schedule for pizza and graph the implied demand curve. Give an example of something that would shift this demand curve, and briefly explain your reasoning. Would a change in the price of pizza shift this demand curve?*

4-3 Supply

We now turn to the other side of the market and examine the behavior of sellers. Once again, to focus our thinking, let's consider the market for ice cream.

4-3a The Supply Curve: The Relationship between Price and Quantity Supplied

The **quantity supplied** of any good or service is the amount that sellers are willing and able to sell. There are many determinants of quantity supplied, but once again, price plays a special role in our analysis. When the price of ice cream is high, selling ice cream is profitable, and so the quantity supplied is large. Sellers of ice cream work long hours, buy many ice-cream machines, and hire many workers. By contrast, when the price of ice cream is low, the business is less profitable, so sellers produce less ice cream. At a low price, some sellers may even choose to shut down, and their quantity supplied falls to zero. This relationship between price and quantity supplied is called the **law of supply**: Other things being equal, when the price of a good rises, the quantity supplied of the good also rises, and when the price falls, the quantity supplied falls as well.

quantity supplied *the amount of a good that sellers are willing and able to sell*

law of supply *the claim that, other things being equal, the quantity supplied of a good rises when the price of the good rises*

The table in Figure 5 shows the quantity of ice-cream cones supplied each month by Ben, an ice-cream seller, at various prices of ice cream. At a price below \$1.00, Ben does not supply any ice cream at all. As the price rises, he supplies a greater and greater quantity. This is the **supply schedule**, a table that shows the relationship between the price of a good and the quantity supplied, holding constant everything else that influences how much producers of the good want to sell.

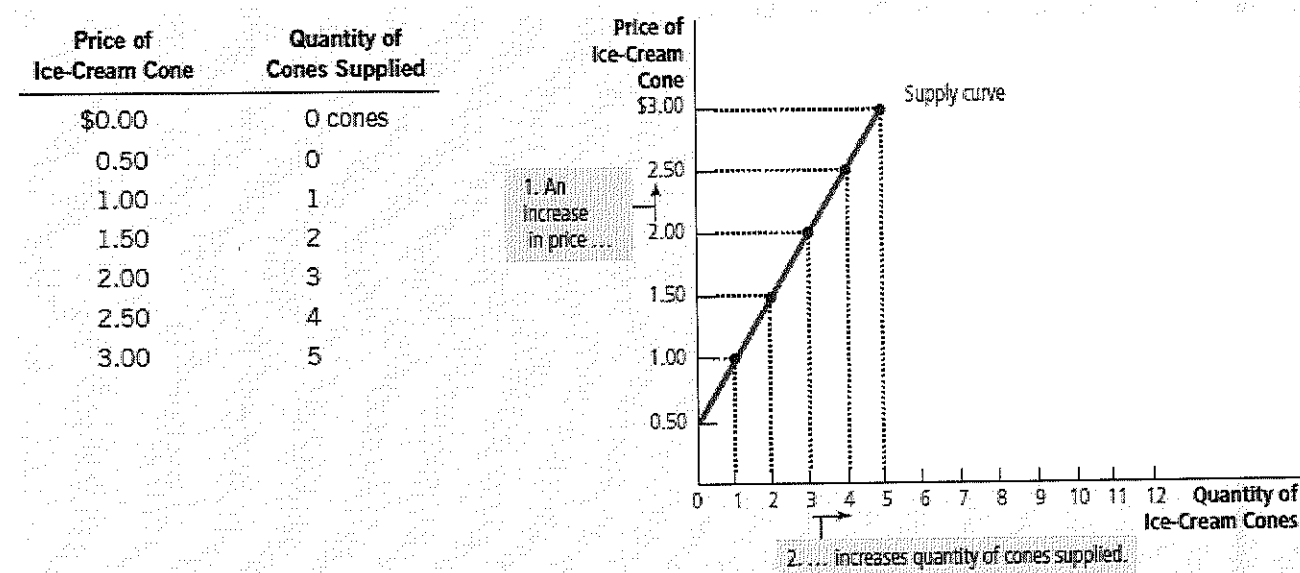
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supply schedule a table that shows the relationship between the price of a good and the quantity supplied

FIGURE 5

Ben's Supply Schedule and Supply Curve

The supply schedule is a table that shows the quantity supplied at each price. This supply curve, which graphs the supply schedule, illustrates how the quantity supplied of the good changes as its price varies. Because a higher price increases the quantity supplied, the supply curve slopes upward.



The graph in Figure 5 uses the numbers from the table to illustrate the law of supply. The curve relating price and quantity supplied is called the **supply curve**. The supply curve slopes upward because, other things being equal, a higher price means a greater quantity supplied.

supply curve a graph of the relationship between the price of a good and the quantity supplied

4-3b Market Supply versus Individual Supply

Just as market demand is the sum of the demands of all buyers, market supply is the sum of the supplies of all sellers. The table in Figure 6 shows the supply schedules for the two ice-cream producers in the market—Ben and Jerry. At any price, Ben's supply schedule tells us the quantity of ice cream that Ben supplies,

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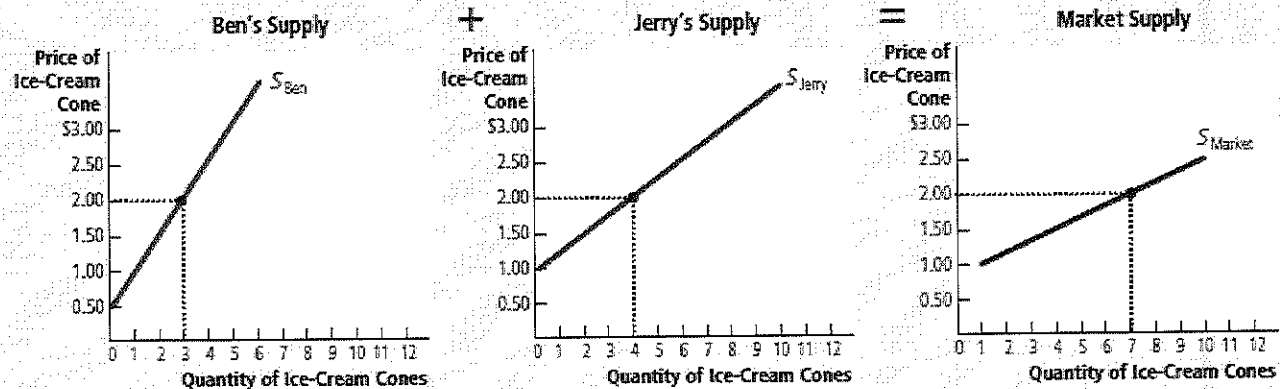
and Jerry's supply schedule tells us the quantity of ice cream that Jerry supplies. The market supply is the sum of the two individual supplies.

FIGURE 6

Market Supply as the Sum of Individual Supplies

The quantity supplied in a market is the sum of the quantities supplied by all the sellers at each price. Thus, the market supply curve is found by adding horizontally the individual supply curves. At a price of \$2.00, Ben supplies 3 ice-cream cones and Jerry supplies 4 ice-cream cones. The quantity supplied in the market at this price is 7 cones.

Price of Ice-Cream Cone	Ben		Jerry		Market
\$0.00	0	+	0	=	0 cones
0.50	0		0		0
1.00	1		0		1
1.50	2		2		4
2.00	3		4		7
2.50	4		6		10
3.00	5		8		13



The graph in Figure 6 shows the supply curves that correspond to the supply schedules. As with demand curves, we sum the individual supply curves *horizontally* to obtain the market supply curve. That is, to find the total quantity supplied at any price, we add the individual quantities, which are found on the horizontal axis of the individual supply curves. The market supply curve shows how the total quantity supplied varies as the price of the good varies, holding constant all the other factors beyond price that influence producers' decisions about how much to sell.

4-3c Shifts in the Supply Curve

Because the market supply curve is drawn holding other things constant, when one of these factors changes, the supply curve shifts. For example, suppose the price of sugar falls. Sugar is an input into the production of ice cream, so the fall in the price of sugar makes selling ice cream more profitable. This raises the supply of ice cream: At any given price, sellers are now willing to produce a larger quantity. The supply curve for ice cream shifts to the right.

Figure 7 illustrates shifts in supply. Any change that raises quantity supplied at every price, such as a fall in the price of sugar, shifts the supply curve to the right and is called an *increase in supply*. Similarly, any change that reduces the quantity supplied at every price shifts the supply curve to the left and is called a *decrease in supply*.

There are many variables that can shift the supply curve. Here are some of the most important.

Input Prices To produce their output of ice cream, sellers use various inputs: cream, sugar, flavoring, ice-cream machines, the buildings in which the ice cream is made, and the labor of workers to mix the ingredients and operate the machines. When the price of one or more of these inputs rises, producing ice cream is less profitable, and firms supply less ice cream. If input prices rise substantially, a firm

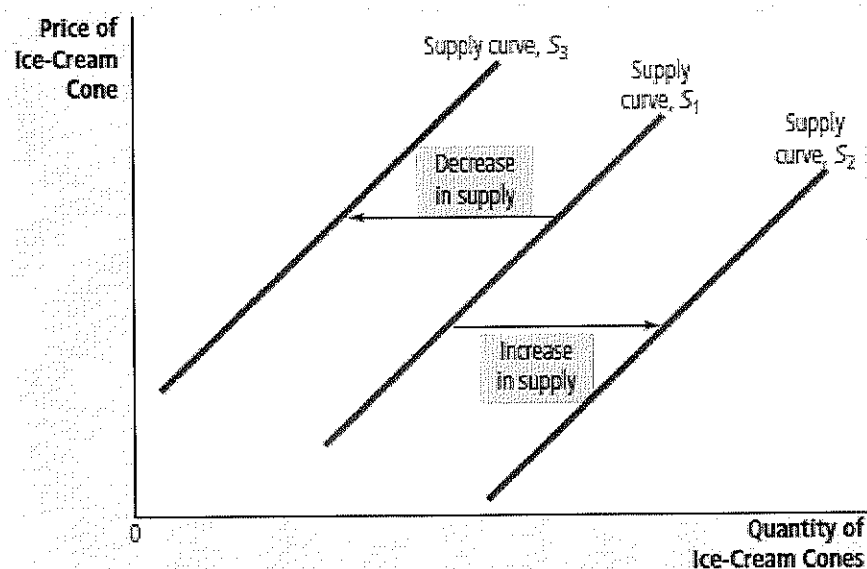
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might shut down and supply no ice cream at all. Thus, the supply of a good is negatively related to the price of the inputs used to make the good.

FIGURE 7

Shifts in the Supply Curve

Any change that raises the quantity that sellers wish to produce at any given price shifts the supply curve to the right. Any change that lowers the quantity that sellers wish to produce at any given price shifts the supply curve to the left.



Technology The technology for turning inputs into ice cream is another determinant of supply. The invention of the mechanized ice-cream machine, for example, reduced the amount of labor necessary to make ice cream. By reducing firms' costs, the advance in technology raised the supply of ice cream.

Expectations The amount of ice cream a firm supplies today may depend on its expectations about the future. For example, if a firm expects the price of ice cream to rise in the future, it will put some of its current production into storage and supply less to the market today.

Number of Sellers In addition to the preceding factors, which influence the behavior of individual sellers, market supply depends on the number of these sellers. If Ben or Jerry were to retire from the ice-cream business, the supply in the market would fall.

Summary The supply curve shows what happens to the quantity supplied of a good when its price varies, holding constant all the other variables that influence sellers. When one of these other variables changes, the supply curve shifts. Table 2 lists the variables that influence how much producers choose to sell of a good.

Once again, to remember whether you need to shift or move along the supply curve, keep in mind that a curve shifts only when there is a change in a relevant variable that is not named on either axis. The price is on the vertical axis, so a change in price represents a movement along the supply curve. By contrast, because input prices, technology, expectations, and the number of sellers are not measured on either axis, a change in one of these variables shifts the supply curve.

Quick Quiz *Make up an example of a monthly supply schedule for pizza, and graph the implied supply curve. Give an example of something that would shift this supply curve, and briefly explain your reasoning. Would a change in the price of pizza shift this supply curve?*

TABLE 2

Variables That Influence Sellers

This table lists the variables that affect how much producers choose to sell of any good. Notice the special role that the price of the good plays: A change in the good's price represents a movement along the supply curve, whereas a change in one of the other variables shifts the supply curve.

Variable	A Change in This Variable ...
Price of the good itself	Represents a movement along the supply curve
Input prices	Shifts the supply curve
Technology	Shifts the supply curve
Expectations	Shifts the supply curve
Number of sellers	Shifts the supply curve

4-4 Supply and Demand Together

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Having analyzed supply and demand separately, we now combine them to see how they determine the price and quantity of a good sold in a market.

4-4a Equilibrium

Figure 8 shows the market supply curve and market demand curve together. Notice that there is one point at which the supply and demand curves intersect. This point is called the market's **equilibrium**. The price at this intersection is called the **equilibrium price**, and the quantity is called the **equilibrium quantity**. Here the equilibrium price is \$2.00 per cone, and the equilibrium quantity is 7 ice-cream cones.

equilibrium a situation in which the market price has reached the level at which quantity supplied equals quantity demanded

equilibrium price the price that balances quantity supplied and quantity demanded

equilibrium quantity the quantity supplied and the quantity demanded at the equilibrium price

The dictionary defines the word *equilibrium* as a situation in which various forces are in balance—and this also describes a market's equilibrium. *At the equilibrium price, the quantity of the good that buyers are willing and able to buy exactly balances the quantity that sellers are willing and able to sell.* The equilibrium price is sometimes called the *market-clearing price* because, at this price, everyone in the market has been satisfied: Buyers have bought all they want to buy, and sellers have sold all they want to sell.

The actions of buyers and sellers naturally move markets toward the equilibrium of supply and demand. To see why, consider what happens when the market price is not equal to the equilibrium price.

Suppose first that the market price is above the equilibrium price, as in panel (a) of Figure 9. At a price of \$2.50 per cone, the quantity of the good supplied (10 cones) exceeds the quantity demanded (4 cones). There is a **surplus** of the good: Suppliers are unable to sell all they want at the going price. A surplus is sometimes called a situation of *excess supply*. When there is a surplus in the icecream market, sellers of ice cream find their freezers increasingly full of ice cream they would like to sell but cannot. They respond to the surplus by cutting their prices. Falling prices, in turn, increase the quantity demanded and decrease the quantity supplied. These changes represent movements *along* the supply and demand curves, not shifts in the curves. Prices continue to fall until the market reaches the equilibrium.

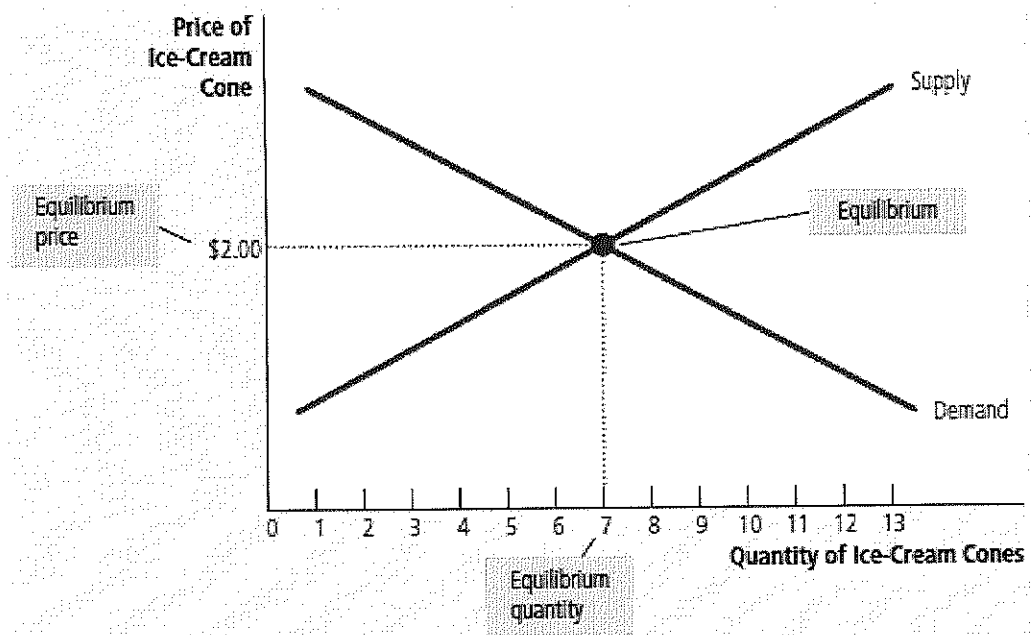
surplus a situation in which quantity supplied is greater than quantity demanded

FIGURE 8

The Equilibrium of Supply and Demand

The equilibrium is found where the supply and demand curves intersect. At the equilibrium price, the quantity supplied equals the quantity demanded. Here the equilibrium price is \$2.00: At this price, 7 ice-cream cones are supplied and 7 icecream cones are demanded.

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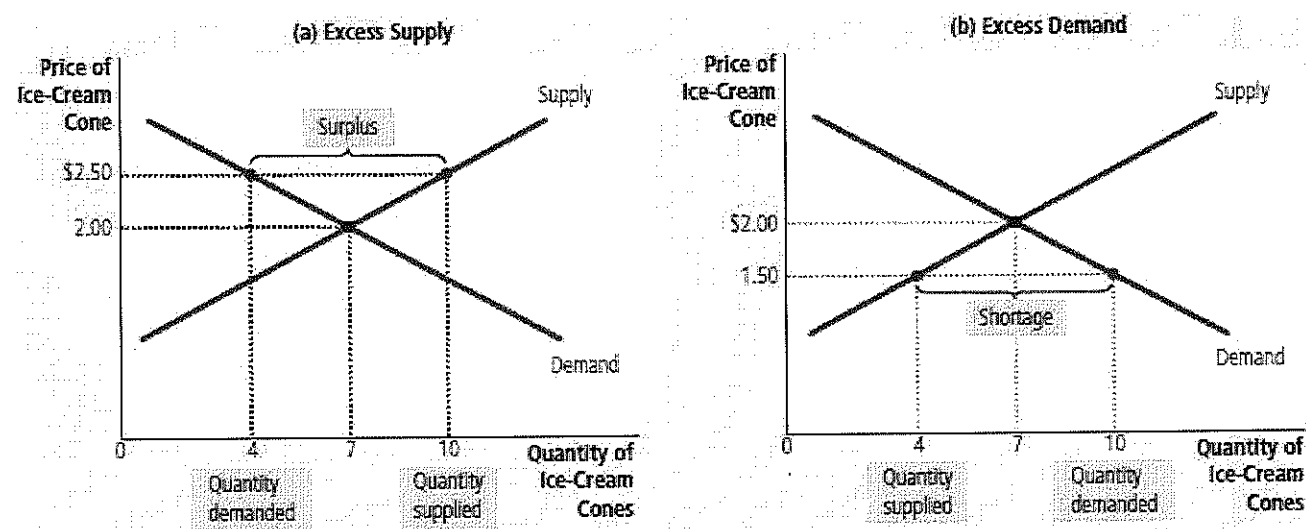


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FIGURE 9

Markets Not in Equilibrium

In panel (a), there is a surplus. Because the market price of \$2.50 is above the equilibrium price, the quantity supplied (10 cones) exceeds the quantity demanded (4 cones). Suppliers try to increase sales by cutting the price of a cone, and this moves the price toward its equilibrium level. In panel (b), there is a shortage. Because the market price of \$1.50 is below the equilibrium price, the quantity demanded (10 cones) exceeds the quantity supplied (4 cones). With too many buyers chasing too few goods, suppliers can take advantage of the shortage by raising the price. Hence, in both cases, the price adjustment moves the market toward the equilibrium of supply and demand.



Suppose now that the market price is below the equilibrium price, as in panel (b) of Figure 9. In this case, the price is \$1.50 per cone, and the quantity of the good demanded exceeds the quantity supplied. There is a **shortage** of the good: Demanders are unable to buy all they want at the going price. A shortage is sometimes called a situation of *excess demand*. When a shortage occurs in the ice-cream market, buyers have to wait in long lines for a chance to buy one of the few cones available. With too many buyers chasing too few goods, sellers can respond to the shortage by raising their prices without losing sales. These price increases cause the quantity demanded to fall and the quantity supplied to rise. Once again, these changes represent movements *along* the supply and demand curves, and they move the market toward the equilibrium.

shortage a situation in which quantity demanded is greater than quantity supplied

Thus, regardless of whether the price starts off too high or too low, the activities of the many buyers and sellers automatically push the market price toward the equilibrium price. Once the market reaches its equilibrium, all buyers and sellers are satisfied, and there is no upward or downward pressure on the price. How quickly equilibrium is reached varies from market to market depending on how quickly prices adjust. In most free markets, surpluses and shortages are only temporary because prices eventually move toward their equilibrium levels. Indeed, this phenomenon is so pervasive that it is called the **law of supply and demand**: The price of any good adjusts to bring the quantity supplied and quantity demanded for that good into balance.

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law of supply and demand *the claim that the price of any good adjusts to bring the quantity supplied and the quantity demanded for that good into balance*

4-4b Three Steps to Analyzing Changes in Equilibrium

So far, we have seen how supply and demand together determine a market's equilibrium, which in turn determines the price and quantity of the good that buyers purchase and sellers produce. The equilibrium price and quantity depend on the position of the supply and demand curves. When some event shifts one of these curves, the equilibrium in the market changes, resulting in a new price and a new quantity exchanged between buyers and sellers.

When analyzing how some event affects the equilibrium in a market, we proceed in three steps. First, we decide whether the event shifts the supply curve, the demand curve, or, in some cases, both curves. Second, we decide whether the curve shifts to the right or to the left. Third, we use the supply-and-demand diagram to compare the initial and the new equilibrium, which shows how the shift affects the equilibrium price and quantity. Table 3 summarizes these three steps. To see how this recipe is used, let's consider various events that might affect the market for ice cream.

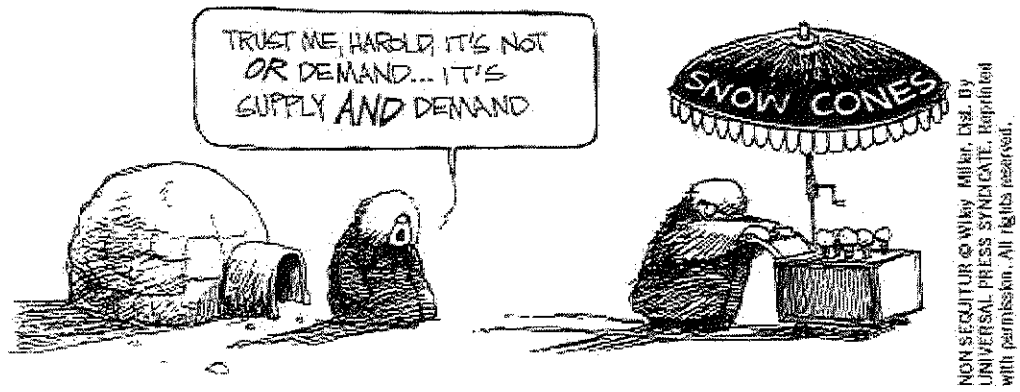
Example: A Change in Market Equilibrium Due to a Shift in Demand Suppose that one summer the weather is very hot. How does this event affect the market for ice cream? To answer this question, let's follow our three steps.

1. The hot weather affects the demand curve by changing people's taste for ice cream. That is, the weather changes the amount of ice cream that people want to buy at any given price. The supply curve is unchanged because the weather does not directly affect the firms that sell ice cream.
2. Because hot weather makes people want to eat more ice cream, the demand curve shifts to the right. Figure 10 shows this increase in demand as a shift in the demand curve from D_1 to D_2 . This shift indicates that the quantity of ice cream demanded is higher at every price.
3. At the old price of \$2, there is now an excess demand for ice cream, and this shortage induces firms to raise the price. As Figure 10 shows, the increase in demand raises the equilibrium price from \$2.00 to \$2.50 and the equilibrium quantity from 7 to 10 cones. In other words, the hot weather increases the price of ice cream and the quantity of ice cream sold.

TABLE 3

Three Steps for Analyzing Changes in Equilibrium

1. Decide whether the event shifts the supply or demand curve (or perhaps both).
2. Decide in which direction the curve shifts.
3. Use the supply-and-demand diagram to see how the shift changes the equilibrium price and quantity.

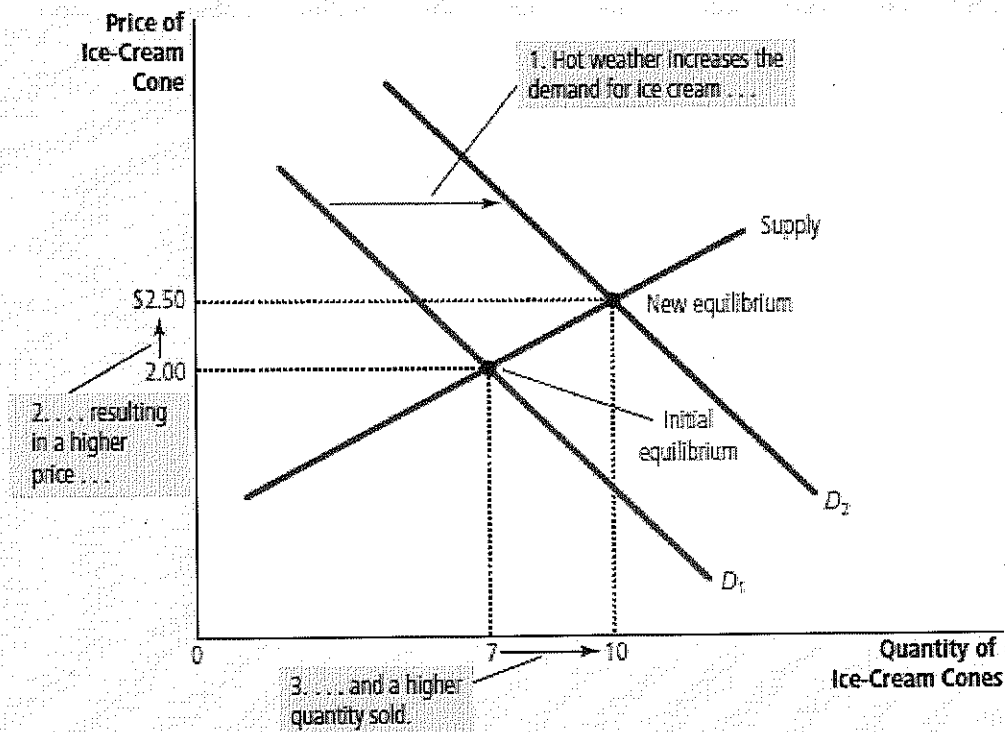


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FIGURE 10

How an Increase in Demand Affects the Equilibrium

An event that raises quantity demanded at any given price shifts the demand curve to the right. The equilibrium price and the equilibrium quantity both rise. Here an abnormally hot summer causes buyers to demand more ice cream. The demand curve shifts from D_1 to D_2 , which causes the equilibrium price to rise from \$2.00 to \$2.50 and the equilibrium quantity to rise from 7 to 10 cones.



Shifts in Curves versus Movements along Curves Notice that when hot weather increases the demand for ice cream and drives up the price, the quantity of ice cream that firms supply rises, even though the supply curve remains the same. In this case, economists say there has been an increase in “quantity supplied” but no change in “supply.”

Supply refers to the position of the supply curve, whereas the *quantity supplied* refers to the amount suppliers wish to sell. In this example, supply does not change because the weather does not alter firms' desire to sell at any given price. Instead, the hot weather alters consumers' desire to buy at any given price and thereby shifts the demand curve to the right. The increase in demand causes the equilibrium price to rise. When the price rises, the quantity supplied rises. This increase in quantity supplied is represented by the movement along the supply curve.

To summarize, a shift *in* the supply curve is called a “change in supply,” and a shift *in* the demand curve is called a “change in demand.” A movement *along* a fixed supply curve is called a “change in the quantity supplied,” and a movement *along* a fixed demand curve is called a “change in the quantity demanded.”

Example: A Change in Market Equilibrium Due to a Shift in Supply Suppose that during another summer, a hurricane destroys part of the sugarcane crop and drives up the price of sugar. How does this

event affect the market for ice cream? Once again, to answer this question, we follow our three steps.

1. The change in the price of sugar, an input for making ice cream, affects the supply curve. By raising the costs of production, it reduces the amount of ice cream that firms produce and sell at any given price. The demand curve does not change because the higher cost of inputs does not directly affect the amount of ice cream households wish to buy.

2.

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The supply curve shifts to the left because, at every price, the total amount that firms are willing and able to sell is reduced. Figure 11 illustrates this decrease in supply as a shift in the supply curve from S_1 to S_2 .

3. At the old price of \$2, there is now an excess demand for ice cream, and this shortage causes firms to raise the price. As Figure 11 shows, the shift in the supply curve raises the equilibrium price from \$2.00 to \$2.50 and lowers the equilibrium quantity from 7 to 4 cones. As a result of the sugar price increase, the price of ice cream rises, and the quantity of ice cream sold falls.

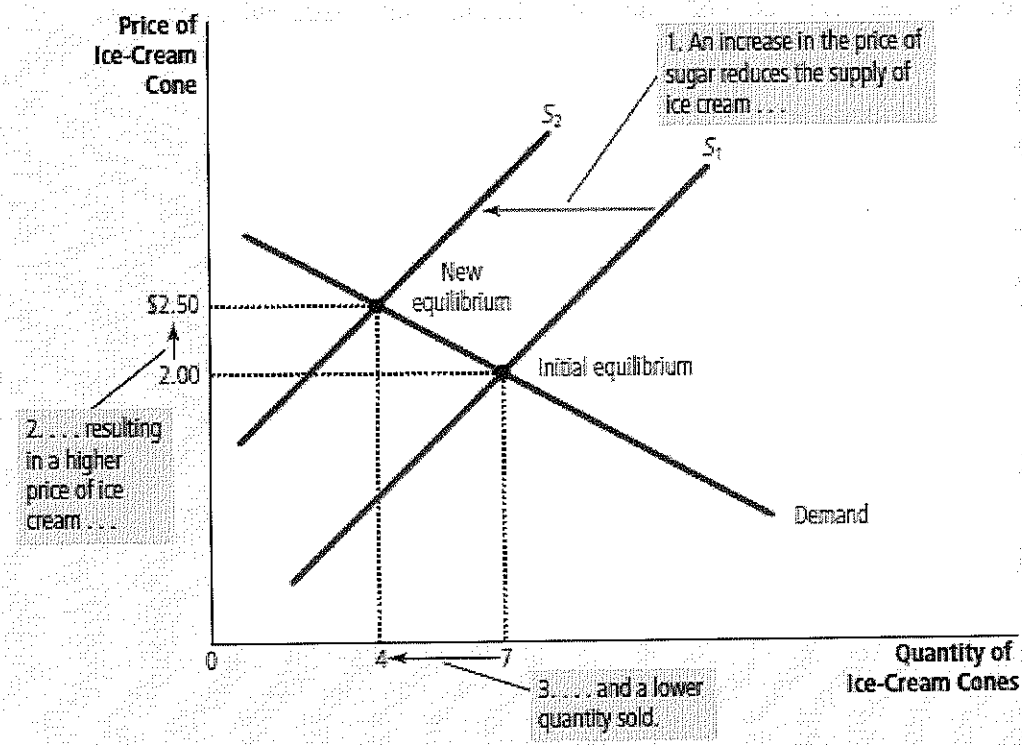
Example: Shifts in Both Supply and Demand Now suppose that a heat wave and a hurricane occur during the same summer. To analyze this combination of events, we again follow our three steps.

1. We determine that both curves must shift. The hot weather affects the demand curve because it alters the amount of ice cream that households want to buy at any given price. At the same time, when the hurricane drives up sugar prices, it alters the supply curve for ice cream because it changes the amount of ice cream that firms want to sell at any given price.
2. The curves shift in the same directions as they did in our previous analysis: The demand curve shifts to the right, and the supply curve shifts to the left. Figure 12 illustrates these shifts.
3. As Figure 12 shows, two possible outcomes might result depending on the relative size of the demand and supply shifts. In both cases, the equilibrium price rises. In panel (a), where demand increases substantially while supply falls just a little, the equilibrium quantity also rises. By contrast, in panel (b), where supply falls substantially while demand rises just a little, the equilibrium quantity falls. Thus, these events certainly raise the price of ice cream, but their impact on the amount of ice cream sold is ambiguous (that is, it could go either way).

FIGURE 11

How a Decrease in Supply Affects the Equilibrium

An event that reduces quantity supplied at any given price shifts the supply curve to the left. The equilibrium price rises, and the equilibrium quantity falls. Here an increase in the price of sugar (an input) causes sellers to supply less ice cream. The supply curve shifts from S_1 to S_2 , which causes the equilibrium price of ice cream to rise from \$2.00 to \$2.50 and the equilibrium quantity to fall from 7 to 4 cones.

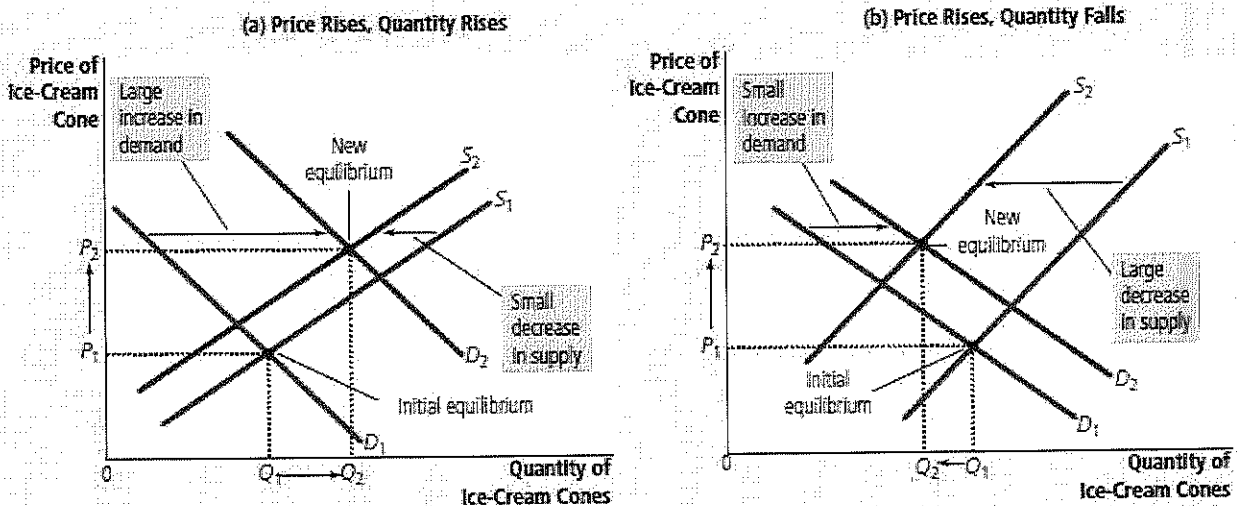


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FIGURE 12

A Shift in Both Supply and Demand

Here we observe a simultaneous increase in demand and decrease in supply. Two outcomes are possible. In panel (a), the equilibrium price rises from P_1 to P_2 and the equilibrium quantity rises from Q_1 to Q_2 . In panel (b), the equilibrium price again rises from P_1 to P_2 but the equilibrium quantity falls from Q_1 to Q_2 .



Summary We have just seen three examples of how to use supply and demand curves to analyze a change in equilibrium. Whenever an event shifts the supply curve, the demand curve, or perhaps both curves, you can use these tools to predict how the event will alter the price and quantity sold in equilibrium. Table 4 shows the predicted outcome for any combination of shifts in the two curves. To make sure you understand how to use the tools of supply and demand, pick a few

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entries in this table and make sure you can explain to yourself why the table contains the prediction that it does.

TABLE 4

What Happens to Price and Quantity When Supply or Demand Shifts?

As a quick quiz, make sure you can explain at least a few of the entries in this table using a supply-and-demand diagram.

	No Change in Supply	An Increase in Supply	A Decrease in Supply
No Change in Demand	P same Q same	P down Q up	P up Q down
An Increase in Demand	P up Q up	P ambiguous Q up	P up Q ambiguous
A Decrease in Demand	P down Q down	P down Q ambiguous	P ambiguous Q down

Quick Quiz On the appropriate diagram, show what happens to the market for pizza if the price of tomatoes rises. • On a separate diagram, show what happens to the market for pizza if the price of hamburgers falls.

4-5 Conclusion: How Prices Allocate Resources

This chapter has analyzed supply and demand in a single market. Although our discussion has centered on the market for ice cream, the lessons learned here apply in most other markets as well. Whenever you go to a store to buy something, you are contributing to the demand for that item. Whenever you look for a job, you are contributing to the supply of labor services. Because supply and demand are such pervasive economic phenomena, the model of supply and demand is a powerful tool for analysis. We will be using this model repeatedly in the following chapters.

One of the *Ten Principles of Economics* discussed in Chapter 1 is that markets are usually a good way to organize economic activity. Although it is still too early to judge whether market outcomes are good or bad, in this chapter we have begun to see how markets work. In any economic system, scarce resources have to be allocated among competing uses. Market economies harness the forces of supply and demand to serve that end. Supply and demand together determine the prices of the economy's many different goods and services; prices in turn are the signals that guide the allocation of resources.

For example, consider the allocation of beachfront land. Because the amount of this land is limited, not everyone can enjoy the luxury of living by the beach. Who gets this resource? The answer is whoever is willing and able to pay the price. The price of beachfront land adjusts until the quantity of land demanded exactly balances the quantity supplied. Thus, in market economies, prices are the mechanism for rationing scarce resources.

Similarly, prices determine who produces each good and how much is produced. For instance, consider farming. Because we need food to survive, it is crucial that some people work on farms. What determines who is a farmer and who is not? In a free society, there is no government planning agency making this

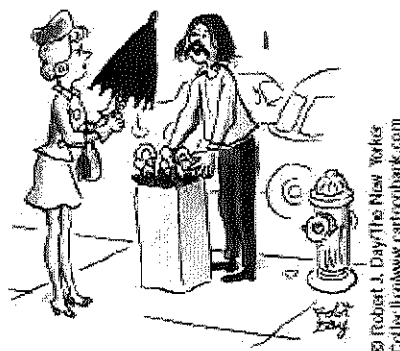
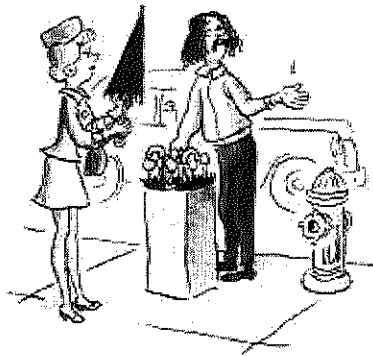
decision and ensuring an adequate supply of food. Instead, the allocation of workers to farms is based on the job decisions of millions of workers. This decentralized system works well because these decisions depend on prices. The prices of food and the wages of farmworkers (the price of their labor) adjust to ensure that enough people choose to be farmers.

If a person had never seen a market economy in action, the whole idea might seem preposterous. Economies are enormous groups of people engaged in a multitude of interdependent activities. What prevents decentralized decision making from degenerating into chaos? What coordinates the actions of the millions of people with their varying abilities and desires? What ensures that what needs to be done is in fact done? The answer, in a word, is *prices*. If an invisible hand guides market economies, as Adam Smith famously suggested, then the price system is the baton that the invisible hand uses to conduct the economic orchestra.

"Two dollars"



"—and seventy-five cents."



IN THE NEWS Price Increases after Disasters

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When a disaster such as a hurricane strikes a region, many goods experience an increase in demand or a decrease in supply, putting upward pressure on prices. Policymakers often object to these price hikes, but this opinion piece endorses the market's natural response.

Is Price Gouging Reverse Looting?

By John Carney

Four dollars for a can of coke. Five hundred dollars a night for a hotel in downtown Brooklyn. A pair of D-batteries for \$6.99.

These are just a few of the examples of price hikes I or friends of mine have personally come across in the run-up and aftermath of hurricane Sandy. Price gouging, as this is often called, is a common occurrence during emergencies.

Price gouging around natural disasters is one of the things politicians on the left and right agree is a terrible, no good, very bad thing. New York Attorney General Eric Schneiderman sent out a press release warning “against price inflation of necessary goods and services during hurricane Sandy.” New Jersey Governor Chris Christie issued a “forceful reminder” that price gouging “will result in significant penalties.” Hotlines have been established to allow consumers to report gouging.

New Jersey's law is very specific. Price increases of more than 10 percent during a declared state of emergency are considered excessive. A New Jersey gas station paid a \$50,000 fine last year for hiking gasoline prices by 16 percent during tropical storm Irene.

New York's law may be even stricter. According to AG Schneiderman's release, all price increases on “necessary goods and items” count as gouging.

“General Business Law prohibits such increase in costs of essential items like food, water, gas, generators, batteries and flashlights, and services like transportation, during natural disasters or other events that disrupt the market,” the NY AG release said.

These laws are built on the quite conventional view that it is unethical for a business to take advantage of a disaster in pursuit of profits. It just seems wrong for business owners to make money on the misery of their neighbors. Merchants earning larger profits because of a disaster seem to be rewarded for doing nothing more than raising their prices.

“It's reverse looting,” a neighbor of mine in Brooklyn said about the price of batteries at a local electronic store.

Unfortunately, ethics runs into economics in a way that can make these laws positively harmful. Price gouging can occur only when there is a shortage of the goods in demand. If there were no shortage, normal market processes would prevent sudden price spikes. A deli owner charging \$4 for a can of Pepsi would discover he was just driving customers to the deli a block away, which charges a buck.

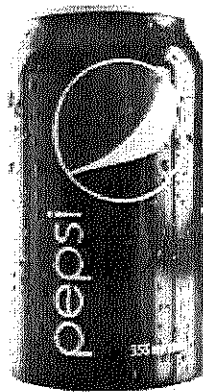
But when everyone suddenly starts buying batteries or bottles of water for fear of a blackout, shortages can arise. Sometimes

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there simply is not enough of a particular good to satisfy a sharp spike in demand. And so the question arises: how do we decide which customers get the batteries, the groceries, the gasoline?

We could hold a lottery. Perhaps people could receive a ticket at the grocery store. Winners would get to shop at the usual prices. Losers would just go hungry. Or, more likely, they would be forced to buy the food away from the lottery winners—at elevated prices no doubt, since no one would buy food just to sell it at the same price. So the gouging would just pass from merchant to lottery winning customer.

Would you pay \$4 for this?



© The Power of Fear: Photographs by John Deane

We could have some sort of rationing program. Each person could be assigned a portion of the necessary goods according to their household need. This is something the U.S. resorted to during World War II. The problem is that rationing requires an immense amount of planning—and an impossible level of knowledge. The rationing bureaucrat would have to know precisely how much of each good was available in a given area and how many people would need it. Good luck getting that in place as a hurricane bears down on your city.

We could simply sell goods on a first come, first serve basis. This is, in fact, what anti-gouging laws encourage. The result is all too familiar. People hoard goods. Store shelves are emptied. And you have to wonder, why is a first to the register race a fairer system than the alternative of market prices? Speed seems a poor proxy for justice.

Allowing prices to rise at times of extreme demand discourages overconsumption. People consider their purchases more carefully. Instead of buying a dozen batteries (or bottles of water or gallons of gas), perhaps they buy half that. The result is that goods under extreme demand are available to more customers. The market process actually results in a more equitable distribution than the anti-gouging laws.

Once we understand this, it's easy to see that merchants aren't really profiting from disaster. They are profiting from managing their prices, which has the socially beneficial effect of broadening distribution and discouraging hoarding. In short, they are being justly rewarded for performing an important public service.

One objection is that a system of free-floating, legal gouging would allow the wealthy to buy everything and leave the poor out altogether. But this concern is overrated. For the most part, price hikes during disasters do not actually put necessary goods and services out of reach of even the poorest people. They just put the budgets of the poor under additional strain. This is a problem better resolved through transfer payments to alleviate the household budgetary effects of the prices after the fact, rather than trying to control the price in the first place....

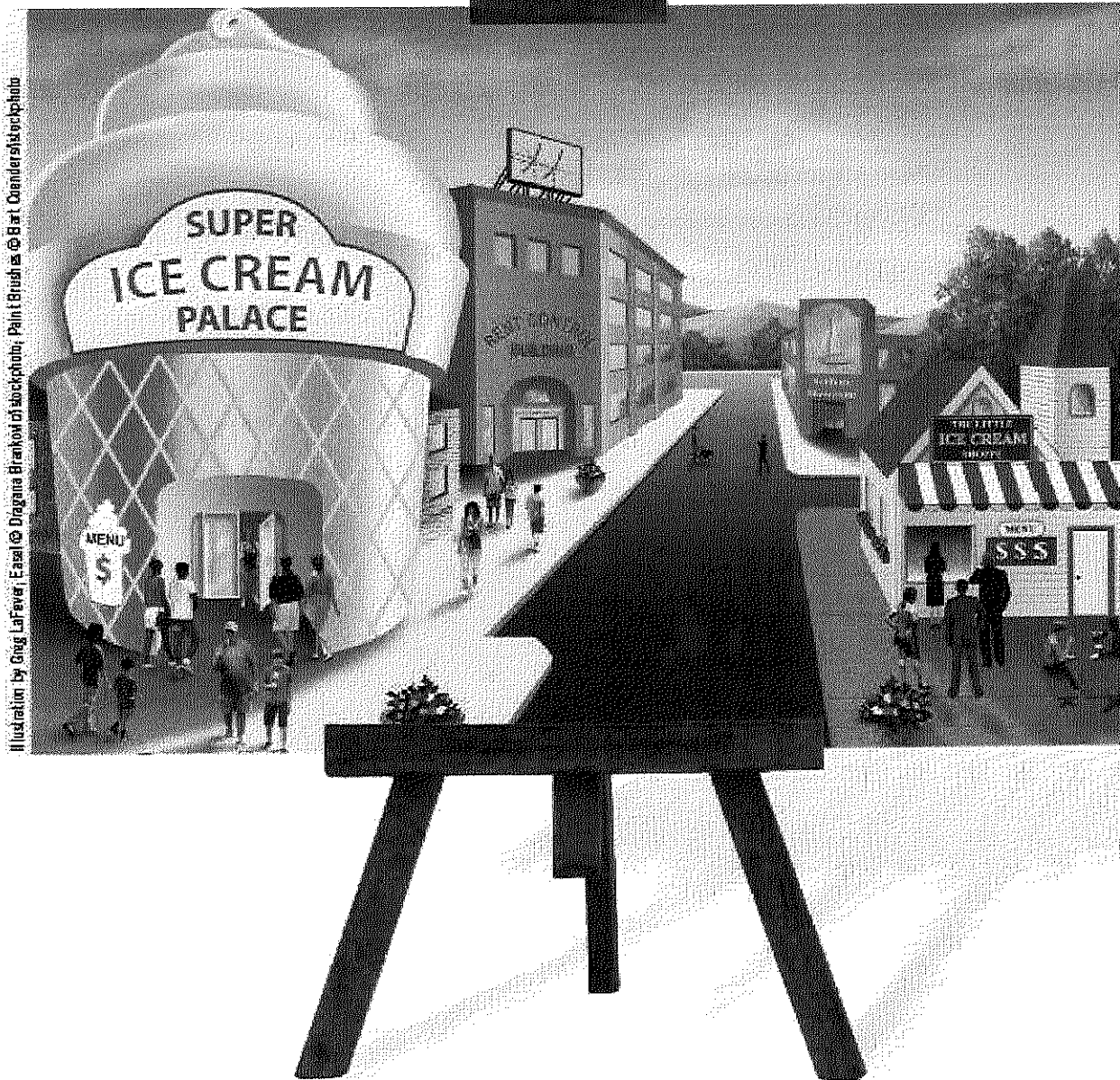
Instead of cracking down on price gougers, we should be using our experience of shortages during this time of crisis to spark a reform of our counter-productive laws. Next time disaster strikes, we should hope for a bit more gouging and a lot fewer empty store shelves. 🗑️

Source: Courtesy of CNBC.

Summary

- Economists use the model of supply and demand to analyze competitive markets. In a competitive market, there are many buyers and sellers, each of whom has little or no influence on the market price.
- The demand curve shows how the quantity of a good demanded depends on the price. According to the law of demand, as the price of a good falls, the quantity demanded rises. Therefore, the demand curve slopes downward.
- In addition to price, other determinants of how much consumers want to buy include income, the prices of substitutes and complements, tastes, expectations, and the number of buyers. If one of these factors changes, the demand curve shifts.
- The supply curve shows how the quantity of a good supplied depends on the price. According to the law of supply, as the price of a good rises, the quantity supplied rises. Therefore, the supply curve slopes upward.
- In addition to price, other determinants of how much producers want to sell include input prices, technology, expectations, and the number of sellers. If one of these factors changes, the supply curve shifts.
- The intersection of the supply and demand curves determines the market equilibrium. At the equilibrium price, the quantity demanded equals the quantity supplied.
- The behavior of buyers and sellers naturally drives markets toward their equilibrium. When the market price is above the equilibrium price, there is a surplus of the good, which causes the market price to fall. When the market price is below the equilibrium price, there is a shortage, which causes the market price to rise.
- To analyze how any event influences a market, we use the supply-and-demand diagram to examine how the event affects the equilibrium price and quantity. To do this, we follow three steps. First, we decide whether the event shifts the supply curve or the demand curve (or both). Second, we decide in which direction the curve shifts. Third, we compare the new equilibrium with the initial equilibrium.
- In market economies, prices are the signals that guide economic decisions and thereby allocate scarce resources. For every good in the economy, the price ensures that supply and demand are in balance. The equilibrium price then determines how much of the good buyers choose to consume and how much sellers choose to produce.

Key Concepts



Economists have two roles. As scientists, they develop and test theories to explain the world around them. As policy advisers, they use their theories to help change the world for the better. The focus of the preceding two chapters has been scientific. We have seen how supply and demand determine the price of a good and the quantity of the good sold. We have also seen how various events shift supply and demand and thereby change the equilibrium price and quantity. And we have developed the concept of elasticity to gauge the size of these changes.

This chapter offers our first look at policy. Here we analyze various types of government policy using only the tools of supply and demand. As you will see, the analysis yields some surprising insights. Policies often have effects that their architects did not intend or anticipate.

We begin by considering policies that directly control prices. For example, rent-control laws dictate a maximum rent that landlords may charge tenants. Minimum-wage laws dictate the lowest wage that firms may pay

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workers. Price controls are usually enacted when policymakers believe that the market price of a good or service is unfair to buyers or sellers. Yet, as we will see, these policies can generate inequities of their own.

After discussing price controls, we consider the impact of taxes. Policymakers use taxes to raise revenue for public purposes and to influence market outcomes. Although the prevalence of taxes in our economy is obvious, their effects are not. For example, when the government levies a tax on the amount that firms pay their workers, do the firms or the workers bear the burden of the tax? The answer is not at all clear—until we apply the powerful tools of supply and demand.

6-1 Controls on Prices

To see how price controls affect market outcomes, let's look once again at the market for ice cream. As we saw in Chapter 4, if ice cream is sold in a competitive market free of government regulation, the price of ice cream adjusts to balance supply and demand: At the equilibrium price, the quantity of ice cream that buyers want to buy exactly equals the quantity that sellers want to sell. To be concrete, let's suppose that the equilibrium price is \$3 per cone.

Some people may not be happy with the outcome of this free-market process. The American Association of Ice-Cream Eaters complains that the \$3 price is too high for everyone to enjoy a cone a day (their recommended daily allowance). Meanwhile, the National Organization of Ice-Cream Makers complains that the \$3 price—the result of “cutthroat competition”—is too low and is depressing the incomes of its members. Each of these groups lobbies the government to pass laws that alter the market outcome by directly controlling the price of an icecream cone.

Because buyers of any good always want a lower price while sellers want a higher price, the interests of the two groups conflict. If the Ice-Cream Eaters are successful in their lobbying, the government imposes a legal maximum on the price at which ice-cream cones can be sold. Because the price is not allowed to rise above this level, the legislated maximum is called a **price ceiling**. By contrast, if the Ice-Cream Makers are successful, the government imposes a legal minimum on the price. Because the price cannot fall below this level, the legislated minimum is called a **price floor**. Let us consider the effects of these policies in turn.

price ceiling *a legal maximum on the price at which a good can be sold*

price floor *a legal minimum on the price at which a good can be sold*

6-1a How Price Ceilings Affect Market Outcomes

When the government, moved by the complaints and campaign contributions of the Ice-Cream Eaters, imposes a price ceiling on the market for ice cream, two outcomes are possible. In panel (a) of Figure 1, the government imposes a price ceiling of \$4 per cone. In this case, because the price that balances supply and demand (\$3) is below the ceiling, the price ceiling is *not binding*. Market forces naturally move the economy to the equilibrium, and the price ceiling has no effect on the price or the quantity sold.

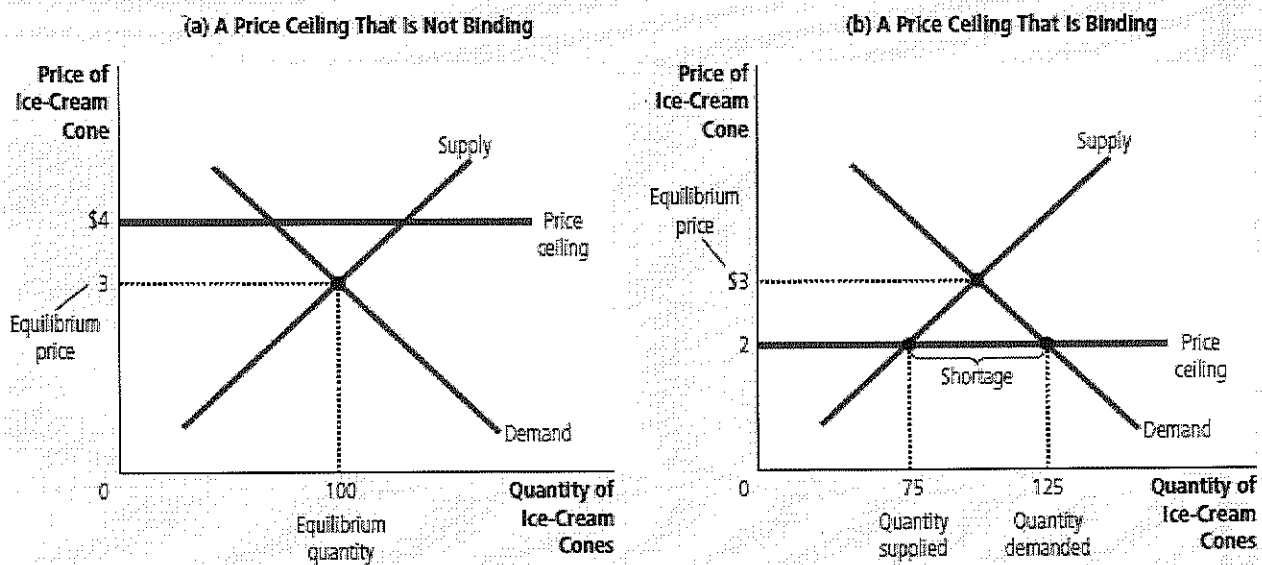
Panel (b) of Figure 1 shows the other, more interesting, possibility. In this case, the government imposes a price ceiling of \$2 per cone. Because the equilibrium price of \$3 is above the price ceiling, the ceiling is a *binding constraint* on the market. The forces of supply and demand tend to move the price toward the equilibrium price, but when the market price hits the ceiling, it cannot, by law, rise any further. Thus, the market price equals the price ceiling. At this price, the quantity of ice cream demanded (125 cones in Figure 1) exceeds the quantity supplied (75 cones). There is a shortage: 50 people who want to buy ice cream at the going price are unable to do so.

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FIGURE 1

A Market with a Price Ceiling

In panel (a), the government imposes a price ceiling of \$4. Because the price ceiling is above the equilibrium price of \$3, the price ceiling has no effect, and the market can reach the equilibrium of supply and demand. In this equilibrium, quantity supplied and quantity demanded both equal 100 cones. In panel (b), the government imposes a price ceiling of \$2. Because the price ceiling is below the equilibrium price of \$3, the market price equals \$2. At this price, 125 cones are demanded and only 75 are supplied, so there is a shortage of 50 cones.



In response to this shortage, some mechanism for rationing ice cream will naturally develop. The mechanism could be long lines: Buyers who are willing to arrive early and wait in line get a cone, but those unwilling to wait do not. Alternatively, sellers could ration ice-cream cones according to their own personal biases, selling them only to friends, relatives, or members of their own racial or ethnic group. Notice that even though the price ceiling was motivated by a desire to help buyers of ice cream, not all buyers benefit from the policy. Some buyers do get to pay a lower price, although they may have to wait in line to do so, but other buyers cannot get any ice cream at all.

This example in the market for ice cream shows a general result: *When the government imposes a binding price ceiling on a competitive market, a shortage of the good arises, and sellers must ration the scarce goods among the large number of potential buyers.* The rationing mechanisms that develop under price ceilings are rarely desirable. Long lines are inefficient because they waste buyers' time. Discrimination according to seller bias is both inefficient (because the good does not necessarily go to the buyer who values it most highly) and potentially unfair. By contrast, the rationing mechanism in a free, competitive market is both efficient and impersonal. When the market for ice cream reaches its equilibrium, anyone who wants to pay the market price can get a cone. Free markets ration goods with prices.

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case study **Lines at the Gas Pump**

As we discussed in Chapter 5, in 1973 the Organization of Petroleum Exporting Countries (OPEC) raised the price of crude oil in world oil markets. Because crude oil is the major input used to make gasoline, the higher oil prices reduced the supply of gasoline. Long lines at gas stations became commonplace, and motorists often had to wait for hours to buy only a few gallons of gas.

What was responsible for the long gas lines? Most people blame OPEC. Surely, if OPEC had not raised the price of crude oil, the shortage of gasoline would not have occurred. Yet economists blame U.S. government regulations that limited the price oil companies could charge for gasoline.

Figure 2 shows what happened. As shown in panel (a), before OPEC raised the price of crude oil, the equilibrium price of gasoline, P_1 , was below the price ceiling. The price regulation, therefore, had no effect. When the price of crude oil rose, however, the situation changed. The increase in the price of crude oil raised the cost of producing gasoline, and this reduced the supply of gasoline. As panel (b) shows, the supply curve shifted to the left from S_1 to S_2 . In an unregulated market, this shift in supply would have raised the equilibrium price of gasoline from P_1 to P_2 , and no shortage would have resulted. Instead, the price ceiling prevented the price from rising to the equilibrium level. At the price ceiling, producers were

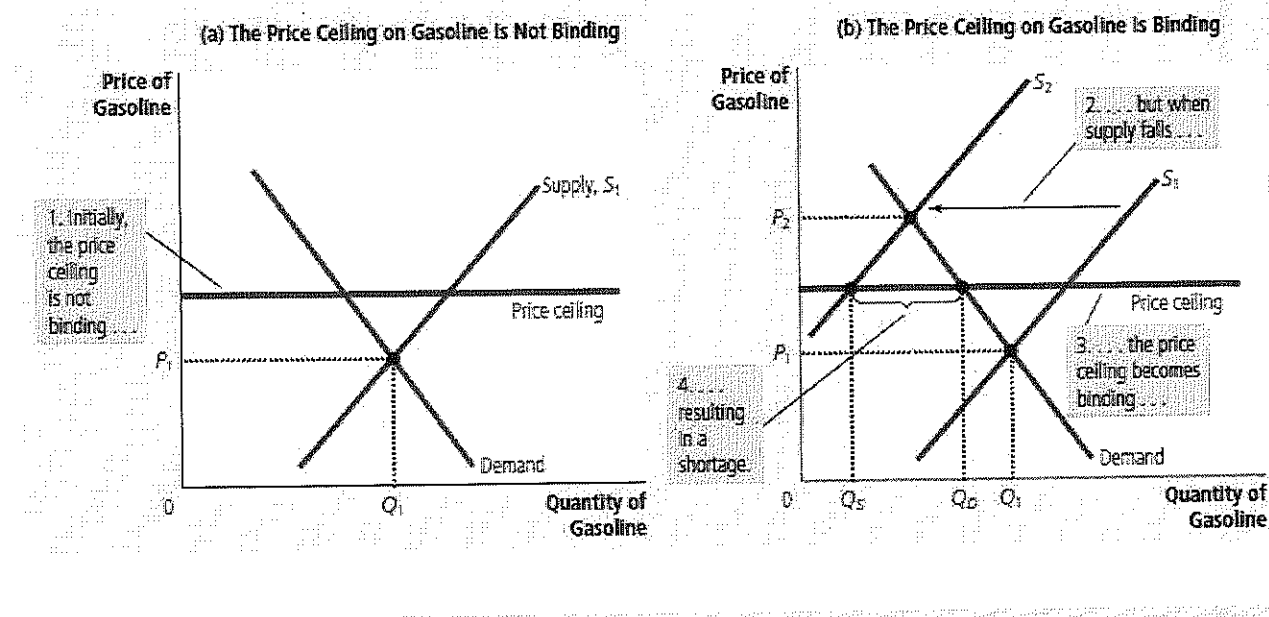
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willing to sell Q_S , and consumers were willing to buy Q_D . Thus, the shift in supply caused a severe shortage at the regulated price.

FIGURE 2

The Market for Gasoline with a Price Ceiling

Panel (a) shows the gasoline market when the price ceiling is not binding because the equilibrium price, P_1 , is below the ceiling. Panel (b) shows the gasoline market after an increase in the price of crude oil (an input into making gasoline) shifts the supply curve to the left from S_1 to S_2 . In an unregulated market, the price would have risen from P_1 to P_2 . The price ceiling, however, prevents this from happening. At the binding price ceiling, consumers are willing to buy Q_D , but producers of gasoline are willing to sell only Q_S . The difference between quantity demanded and quantity supplied, $Q_D - Q_S$, measures the gasoline shortage.



Eventually, the laws regulating the price of gasoline were repealed. Lawmakers came to understand that they were partly responsible for the many hours Americans lost waiting in line to buy gasoline. Today, when the price of crude oil changes, the price of gasoline can adjust to bring supply and demand into equilibrium. ▲

case study Rent Control in the Short Run and the Long Run

One common example of a price ceiling is rent control. In many cities, the local government places a ceiling on rents that landlords may charge their tenants. The goal of this policy is to help the poor by making housing more affordable. Economists often criticize rent control, arguing that it is a highly inefficient way to help the poor raise their standard of living. One economist called rent control "the best way to destroy a city, other than bombing."

The adverse effects of rent control are less apparent to the general population because these effects occur over many years. In the short run, landlords have a fixed number of apartments to rent, and they cannot adjust this number quickly as market conditions change. Moreover, the number of people searching for housing in a city may not be highly responsive to rents in the short run because people

take time to adjust their housing arrangements. Therefore, the short-run supply and demand for housing are relatively inelastic.

Panel (a) of Figure 3 shows the short-run effects of rent control on the housing market. As with any binding price ceiling, rent control causes a shortage.

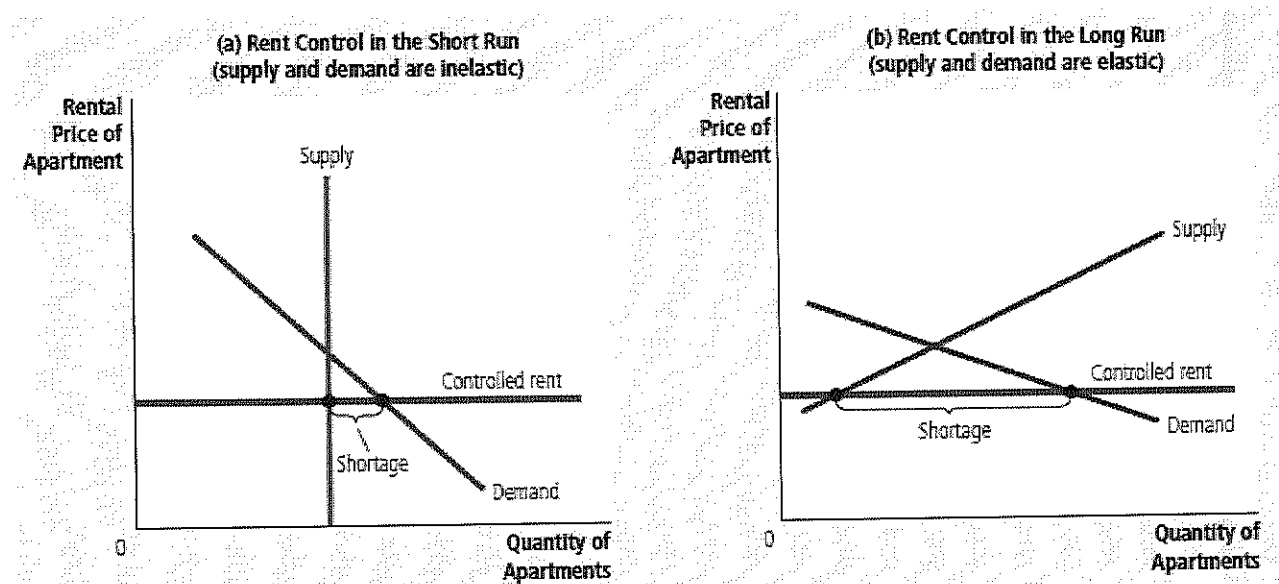
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Yet because supply and demand are inelastic in the short run, the initial shortage caused by rent control is small. The primary effect in the short run is to reduce rents.

FIGURE 3

Rent Control in the Short Run and in the Long Run

Panel (a) shows the short-run effects of rent control: Because the supply and demand curves for apartments are relatively inelastic, the price ceiling imposed by a rent-control law causes only a small shortage of housing. Panel (b) shows the long-run effects of rent control: Because the supply and demand curves for apartments are more elastic, rent control causes a large shortage.



The long-run story is very different because the buyers and sellers of rental housing respond more to market conditions as time passes. On the supply side, landlords respond to low rents by not building new apartments and by failing to maintain existing ones. On the demand side, low rents encourage people to find their own apartments (rather than living with their parents or sharing apartments with roommates) and induce more people to move into a city. Therefore, both supply and demand are more elastic in the long run.

Panel (b) of Figure 3 illustrates the housing market in the long run. When rent control depresses rents below the equilibrium level, the quantity of apartments supplied falls substantially, and the quantity of apartments demanded rises substantially. The result is a large shortage of housing.

In cities with rent control, landlords use various mechanisms to ration housing. Some landlords keep long waiting lists. Others give a preference to tenants without children. Still others discriminate on the basis of race. Sometimes apartments are allocated to those willing to offer under-the-table payments to building superintendents. In essence, these bribes bring the total price of an apartment closer to the equilibrium price.

To understand fully the effects of rent control, we have to remember one of the *Ten Principles of Economics* from Chapter 1: People respond to incentives. In free markets, landlords try to keep their buildings clean and safe because desirable apartments command higher prices. By contrast, when rent control creates shortages and waiting lists, landlords lose their incentive to respond to tenants'

concerns. Why should a landlord spend money to maintain and improve the property when people are waiting to get in as it is? In the end, tenants get lower rents, but they also get lower-quality housing.

Policymakers often react to the effects of rent control by imposing additional regulations. For example, various laws make racial discrimination in housing illegal and require landlords to provide minimally adequate living conditions. These laws, however, are difficult and costly to enforce. By contrast, when rent control is eliminated and a market for housing is regulated by the forces of competition, such laws are less necessary. In a free market, the price of housing adjusts to eliminate the shortages that give rise to undesirable landlord behavior. ▲

6-1b How Price Floors Affect Market Outcomes

To examine the effects of another kind of government price control, let's return to the market for ice cream. Imagine now that the government is persuaded by the pleas of the National Organization of Ice-Cream Makers whose members feel the \$3 equilibrium price is too low. In this case, the government might institute a price floor. Price floors, like price ceilings, are an attempt by the government to maintain prices at other than equilibrium levels. Whereas a price ceiling places a legal maximum on prices, a price floor places a legal minimum.

When the government imposes a price floor on the ice-cream market, two outcomes are possible. If the government imposes a price floor of \$2 per cone when the equilibrium price is \$3, we obtain the outcome in panel (a) of Figure 4. In this case, because the equilibrium price is above the floor, the price floor is not binding. Market forces naturally move the economy to the equilibrium, and the price floor has no effect.

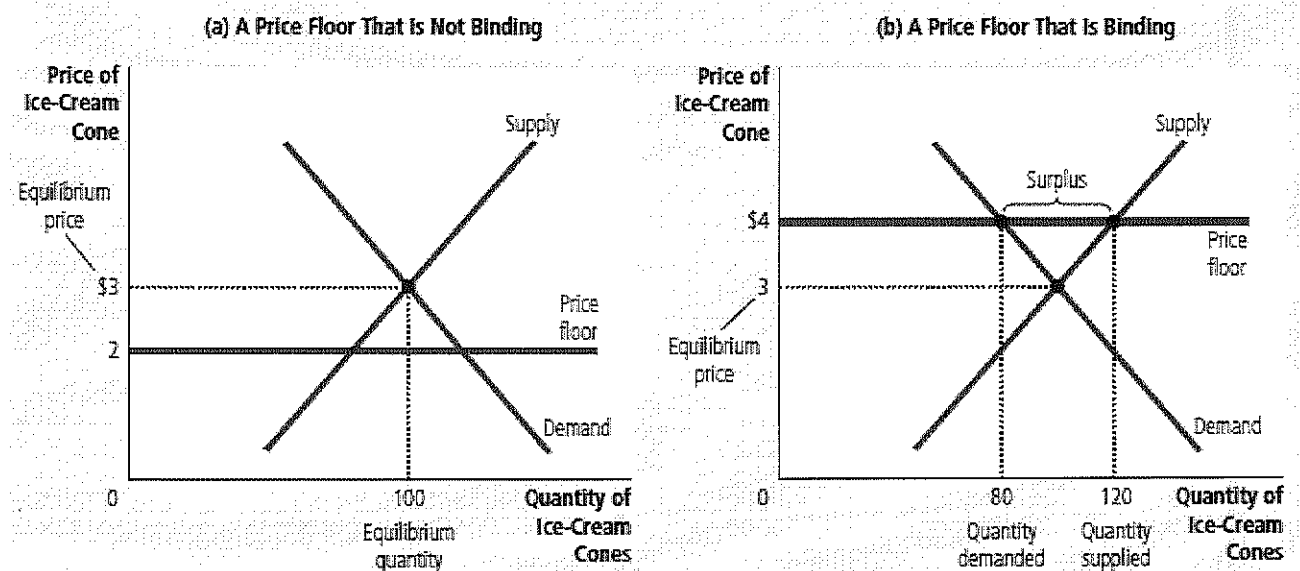
Panel (b) of Figure 4 shows what happens when the government imposes a price floor of \$4 per cone. In this case, because the equilibrium price of \$3 is below the floor, the price floor is a binding constraint on the market. The forces of supply and demand tend to move the price toward the equilibrium price, but when the market price hits the floor, it can fall no further. The market price equals the price floor. At this floor, the quantity of ice cream supplied (120 cones) exceeds the quantity demanded (80 cones). Some people who want to sell ice cream at the going price are unable to. *Thus, a binding price floor causes a surplus.*

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FIGURE 4

A Market with a Price Floor

In panel (a), the government imposes a price floor of \$2. Because this is below the equilibrium price of \$3, the price floor has no effect. The market price adjusts to balance supply and demand. At the equilibrium, quantity supplied and quantity demanded both equal 100 cones. In panel (b), the government imposes a price floor of \$4, which is above the equilibrium price of \$3. Therefore, the market price equals \$4. Because 120 cones are supplied at this price and only 80 are demanded, there is a surplus of 40 cones.



Just as the shortages resulting from price ceilings can lead to undesirable rationing mechanisms, so can the surpluses resulting from price floors. The sellers who appeal to the personal biases of the buyers, perhaps due to racial or familial ties, may be better able to sell their goods than those who do not. By contrast, in a free market, the price serves as the rationing mechanism, and sellers can sell all they want at the equilibrium price.

case study The Minimum Wage

An important example of a price floor is the minimum wage. Minimum-wage laws dictate the lowest price for labor that any employer may pay. The U.S. Congress first instituted a minimum wage with the Fair Labor Standards Act of 1938 to ensure workers a minimally adequate standard of living. In 2012, the minimum wage according to federal law was \$7.25 per hour. (Some states mandate minimum wages above the federal level.) Most European nations have minimum-wage laws as well, sometimes significantly higher than in the United States. For example, average income in France is 27 percent lower than

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it is in the United States, but the French minimum wage is 9.40 euros per hour, which is about \$12 per hour.

To examine the effects of a minimum wage, we must consider the market for labor. Panel (a) of Figure 5 shows the labor market, which, like all markets, is subject to the forces of supply and demand. Workers determine the supply of labor, and firms determine the demand. If the government doesn't intervene, the wage normally adjusts to balance labor supply and labor demand.

Panel (b) of Figure 5 shows the labor market with a minimum wage. If the minimum wage is above the equilibrium level, as it is here, the quantity of labor supplied exceeds the quantity demanded. The result is unemployment. Thus, the minimum wage raises the incomes of those workers who have jobs, but it lowers the incomes of workers who cannot find jobs.

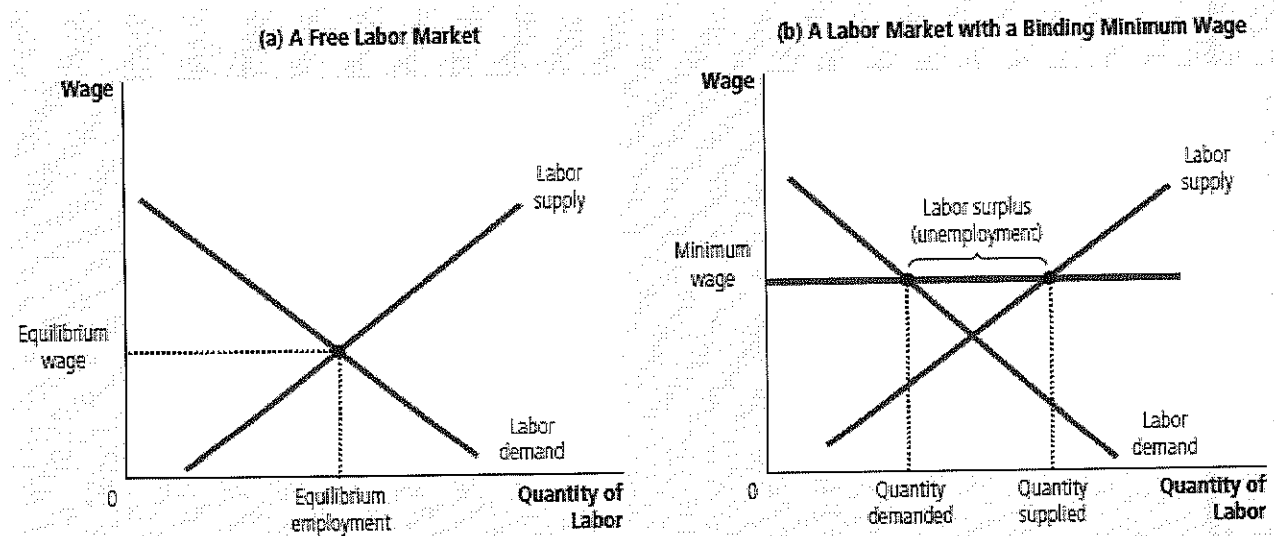
To fully understand the minimum wage, keep in mind that the economy contains not a single labor market but many labor markets for different types of workers. The impact of the minimum wage depends on the skill and experience of the worker. Highly skilled and experienced workers are not affected because their equilibrium wages are well above the minimum. For these workers, the minimum wage is not binding.

The minimum wage has its greatest impact on the market for teenage labor. The equilibrium wages of teenagers are low because teenagers are among the least skilled and least experienced members of the labor force. In addition, teenagers are often willing to accept a lower wage in exchange for on-the-job training. (Some teenagers are willing to work as "interns" for no pay at all. Because internships pay nothing, however, the minimum wage does not apply to them. If it did, these jobs might not exist.) As a result, the minimum wage is binding more often for teenagers than for other members of the labor force.

FIGURE 5

How the Minimum Wage Affects the Labor Market

Panel (a) shows a labor market in which the wage adjusts to balance labor supply and labor demand. Panel (b) shows the impact of a binding minimum wage. Because the minimum wage is a price floor, it causes a surplus: The quantity of labor supplied exceeds the quantity demanded. The result is unemployment.



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Many economists have studied how minimum-wage laws affect the teenage labor market. These researchers compare the changes in the minimum wage over time with the changes in teenage employment. Although there is some debate about how much the minimum wage affects employment, the typical study finds that a 10 percent increase in the minimum wage depresses teenage employment between 1 and 3 percent. In interpreting this estimate, note that a 10 percent increase in the minimum wage does not raise the average wage of teenagers by 10 percent. A change in the law does not directly affect those teenagers who are already paid well above the minimum, and enforcement of minimum-wage laws is not perfect. Thus, the estimated drop in employment of 1 to 3 percent is significant.

In addition to altering the quantity of labor demanded, the minimum wage alters the quantity supplied. Because the minimum wage raises the wage that teenagers can earn, it increases the number of teenagers who choose to look for jobs. Studies have found that a higher minimum wage influences which teenagers are employed. When the minimum wage rises, some teenagers who are still attending high school choose to drop out and take jobs. These new dropouts displace other teenagers who had already dropped out of school and who now become unemployed.

The minimum wage is a frequent topic of debate. Economists are about evenly divided on the issue. In a 2006 survey of Ph.D. economists, 47 percent favored eliminating the minimum wage, while 14 percent would maintain it at its current level and 38 percent would increase it.

Advocates of the minimum wage view the policy as one way to raise the income of the working poor. They correctly point out that workers who earn the minimum wage can afford only a meager standard of living. In 2012, for instance, when the minimum wage was \$7.25 per hour, two adults working 40 hours a week for every week of the year at minimum-wage jobs had a total annual income of only \$30,160, which was less than two-thirds of the median family income in the United States. Many advocates of the minimum wage admit that it has some adverse effects, including unemployment, but they believe that these effects are small and that, all things considered, a higher minimum wage makes the poor better off.

Opponents of the minimum wage contend that it is not the best way to combat poverty. They note that a high minimum wage causes unemployment, encourages teenagers to drop out of school, and prevents some unskilled workers from getting the on-the-job training they need. Moreover, opponents of the minimum wage point out that it is a poorly targeted policy. Not all minimum-wage workers are heads of households trying to help their families escape poverty. In fact, fewer than a third of minimum-wage earners are in families with incomes below the poverty line. Many are teenagers from middle-class homes working at part-time jobs for extra spending money. ▲

6-1c Evaluating Price Controls

One of the *Ten Principles of Economics* discussed in Chapter 1 is that markets are usually a good way to organize economic activity. This principle explains why economists usually oppose price ceilings and price floors. To economists, prices are not the outcome of some haphazard process. Prices, they contend, are the result of the millions of business and consumer decisions that lie behind the supply and demand curves. Prices have the crucial job of balancing supply and demand and, thereby, coordinating economic activity. When policymakers set prices by legal decree, they obscure the signals that normally guide the allocation of society's resources.

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IN THE NEWS **Venezuela versus the Market**



This is what happens when political leaders replace market prices with their own.

With Venezuelan Food Shortages, Some Blame Price Controls

By William Neuman

CARACAS, Venezuela — By 6:30 a.m., a full hour and a half before the store would open, about two dozen people were already in line. They waited patiently, not for the latest iPhone, but for something far more basic: groceries.

“Whatever I can get,” said Katherine Huga, 23, a mother of two, describing her shopping list. She gave a shrug of resignation. “You buy what they have.”

Venezuela is one of the world's top oil producers at a time of soaring energy prices, yet shortages of staples like milk, meat and toilet paper are a chronic part of life here, often turning grocery shopping into a hit or miss proposition.

Some residents arrange their calendars around the once-a-week deliveries made to government-subsidized stores like this one, lining up before dawn to buy a single frozen chicken before the stock runs out. Or a couple of bags of flour. Or a bottle of cooking oil.

The shortages affect both the poor and the well-off, in surprising ways. A supermarket in the upscale La Castellana neighborhood recently had plenty of chicken and cheese—even quail eggs—but not a single roll of toilet paper. Only a few bags of coffee remained on a bottom shelf.

Asked where a shopper could get milk on a day when that, too, was out of stock, a manager said with sarcasm, “At Chávez's house.”

At the heart of the debate is President Hugo Chávez's socialist-inspired government, which imposes strict price controls that are intended to make a range of foods and other goods more affordable for the poor. They are often the very products that are the hardest to find.

“Venezuela is too rich a country to have this,” Nery Reyes, 55, a restaurant worker, said outside a government-subsidized store in the working-class Santa Rosalía neighborhood. “I'm wasting my day here standing in line to buy one chicken and some rice.”

Venezuela was long one of the most prosperous countries in the region, with sophisticated manufacturing, vibrant agriculture and strong businesses, making it hard for many residents to accept such widespread scarcities. But amid the prosperity, the gap between rich and poor was extreme, a problem that Mr. Chávez and his ministers say they are trying to eliminate.

They blame unfettered capitalism for the country's economic ills and argue that controls are needed to keep prices in check in a country where inflation rose to 27.6 percent last year, one of the highest rates in the world. They say companies cause shortages on purpose, holding products off the market to push up prices. This month, the government required price cuts on fruit juice, toothpaste,

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disposable diapers and more than a dozen other products.

“We are not asking them to lose money, just that they make money in a rational way, that they don't rob the people,” Mr. Chávez said recently.

But many economists call it a classic case of a government causing a problem rather than solving it. Prices are set so low, they say, that companies and producers cannot make a profit. So farmers grow less food, manufacturers cut back production and retailers stock less inventory. Moreover, some of the shortages are in industries, like dairy and coffee, where the government has seized private companies and is now running them, saying it is in the national interest.

In January, according to a scarcity index compiled by the Central Bank of Venezuela, the difficulty of finding basic goods on store shelves was at its worst level since 2008. While that measure has eased considerably, many products can still be hard to come by.

Datanálisis, a polling firm that regularly tracks scarcities, said that powdered milk, a staple here, could not be found in 42 percent of the stores its researchers visited in early March. Liquid milk can be even harder to find.

Other products in short supply last month, according to Datanálisis, included beef, chicken, vegetable oil and sugar. The polling firm also says that the problem is most extreme in the government-subsidized stores that were created to provide affordable food to the poor....

Francisco Rodríguez, an economist with Bank of America Merrill Lynch who studies the Venezuelan economy, said the government might score some political points with the new round of price controls. But over time, he argued, they will spell trouble for the economy.

“In the medium to long term, this is going to be a disaster,” Mr. Rodríguez said.

The price controls also mean that products missing from store shelves usually show up on the black market at much higher prices, a source of outrage for many. For government supporters, that is proof of speculation. Others say it is the consequence of a misguided policy....

If there is one product that Venezuela should be able to produce in abundance it is coffee, a major crop here for centuries. Until 2009, Venezuela was a coffee exporter, but it began importing large amounts of it three years ago to make up for a decline in production.

Farmers and coffee roasters say the problem is simple: retail price controls keep prices close to or below what it costs farmers to grow and harvest the coffee. As a result, many do not invest in new plantings or fertilizer, or they cut back on the amount of land used to grow coffee. Making matters worse, the recent harvest was poor in many areas.

A group representing small- to medium-size roasters said last month that there was no domestic coffee left on the wholesale market—the earliest time of year that industry leaders could remember such supplies running out. The group announced a deal with the government to buy imported beans to keep coffee on store shelves.

Similar problems have played out with other agricultural products under price controls, like lags in production and rising imports for beef, milk and corn.

Waiting in line to buy chicken and other staples, Jenny Montero, 30, recalled how she could not find cooking oil last fall and had to switch from the fried food she prefers to soups and stews.

“It was good for me,” she said drily, pushing her 14-month-old daughter in a stroller. “I lost several pounds.” ■

Source: *New York Times*, April 20, 2012.

Another one of the *Ten Principles of Economics* is that governments can sometimes improve market outcomes. Indeed, policymakers are led to control prices because they view the market's outcome as unfair. Price controls are often aimed at helping the poor. For instance, rent-control laws try to make housing affordable for everyone, and minimum-wage laws try to help people escape poverty.

Yet price controls often hurt those they are trying to help. Rent control may keep rents low, but it also discourages landlords from maintaining their buildings and makes housing hard to find. Minimum-wage laws may raise the incomes of some workers, but they also cause other workers to be unemployed.

Helping those in need can be accomplished in ways other than controlling prices. For instance, the government can make housing more affordable by paying a fraction of the rent for poor families. Unlike rent control, such rent subsidies do not reduce the quantity of housing supplied and, therefore, do not lead to housing shortages. Similarly, wage subsidies raise the living standards of the working poor without discouraging firms from hiring them. An example of a wage subsidy is the *earned income tax credit*, a government program that supplements the incomes of low-wage workers.

Although these alternative policies are often better than price controls, they are not perfect. Rent and wage subsidies cost the government money and, therefore, require higher taxes. As we see in the next section, taxation has costs of its own.

Quick Quiz Define price ceiling and price floor and give an example of each. Which leads to a shortage? Which leads to a surplus? Why?

6-2 Taxes

All governments—from the federal government in Washington, D.C., to the local governments in small towns—use taxes to raise revenue for public projects, such as roads, schools, and national defense. Because taxes are such an important policy instrument, and because they affect our lives in many ways, we return to the

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study of taxes several times throughout this book. In this section, we begin our study of how taxes affect the economy.

To set the stage for our analysis, imagine that a local government decides to hold an annual ice-cream celebration—with a parade, fireworks, and speeches by town officials. To raise revenue to pay for the event, the town decides to place a \$0.50 tax on the sale of ice-cream cones. When the plan is announced, our two lobbying groups swing into action. The American Association of Ice-Cream Eaters claims that consumers of ice cream are having trouble making ends meet, and it argues that *sellers* of ice cream should pay the tax. The National Organization of Ice-Cream Makers claims that its members are struggling to survive in a competitive market, and it argues that *buyers* of ice cream should pay the tax. The town mayor, hoping to reach a compromise, suggests that half the tax be paid by the buyers and half be paid by the sellers.

To analyze these proposals, we need to address a simple but subtle question: When the government levies a tax on a good, who actually bears the burden of the tax? The people buying the good? The people selling the good? Or if buyers and sellers share the tax burden, what determines how the burden is divided? Can the government simply legislate the division of the burden, as the mayor is suggesting, or is the division determined by more fundamental market forces? The term **tax incidence** refers to how the burden of a tax is distributed among the various people who make up the economy. As we will see, some surprising lessons about tax incidence can be learned by applying the tools of supply and demand.

tax incidence the manner in which the burden of a tax is shared among participants in a market

6-2a How Taxes on Sellers Affect Market Outcomes

We begin by considering a tax levied on sellers of a good. Suppose the local government passes a law requiring sellers of ice-cream cones to send \$0.50 to the government for each cone they sell. How does this law affect the buyers and sellers of ice cream? To answer this question, we can follow the three steps in Chapter 4 for analyzing supply and demand: (1) We decide whether the law affects the supply curve or demand curve. (2) We decide which way the curve shifts. (3) We examine how the shift affects the equilibrium price and quantity.

Step One The immediate impact of the tax is on the sellers of ice cream. Because the tax is not levied on buyers, the quantity of ice cream demanded at any given price is the same; thus, the demand curve does not change. By contrast, the tax on sellers makes the ice-cream business less profitable at any given price, so it shifts the supply curve.

Step Two Because the tax on sellers raises the cost of producing and selling ice cream, it reduces the quantity supplied at every price. The supply curve shifts to the left (or, equivalently, upward).

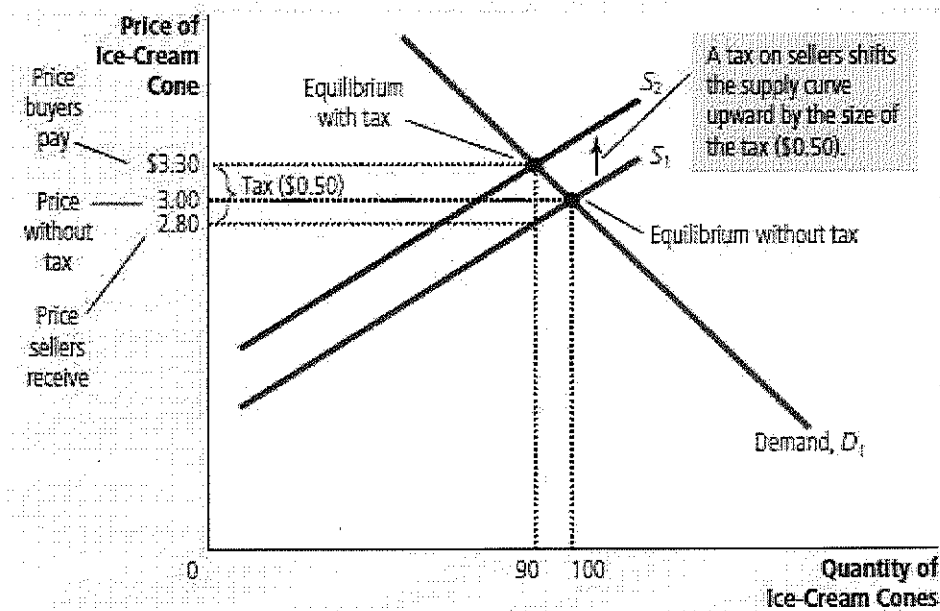
In addition to determining the direction in which the supply curve moves, we can also be precise about the size of the shift. For any market price of ice cream, the effective price to sellers—the amount they get to keep after paying the tax—is \$0.50 lower. For example, if the market price of a cone happened to be \$2.00, the effective price received by sellers would be \$1.50. Whatever the market price, sellers will supply a quantity of ice cream as if the price were \$0.50 lower than it is. Put differently, to induce sellers to supply any given quantity, the market price must now be \$0.50 higher to compensate for the effect of the tax. Thus, as shown in Figure 6, the supply curve shifts *upward* from S_1 to S_2 by the exact size of the tax (\$0.50).

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FIGURE 6

A Tax on Sellers

When a tax of \$0.50 is levied on sellers, the supply curve shifts up by \$0.50 from S_1 to S_2 . The equilibrium quantity falls from 100 to 90 cones. The price that buyers pay rises from \$3.00 to \$3.30. The price that sellers receive (after paying the tax) falls from \$3.00 to \$2.80. Even though the tax is levied on sellers, buyers and sellers share the burden of the tax.



Step Three Having determined how the supply curve shifts, we can now compare the initial and the new equilibriums. Figure 6 shows that the equilibrium price of ice cream rises from \$3.00 to \$3.30, and the equilibrium quantity falls from 100 to 90 cones. Because sellers sell less and buyers buy less in the new equilibrium, the tax reduces the size of the ice-cream market.

Implications We can now return to the question of tax incidence: Who pays the tax? Although sellers send the entire tax to the government, buyers and sellers share the burden. Because the market price rises from \$3.00 to \$3.30 when the tax is introduced, buyers pay \$0.30 more for each ice-cream cone than they did without the tax. Thus, the tax makes buyers worse off. Sellers get a higher price (\$3.30) from buyers than they did previously, but what they get to keep after paying the tax is only \$2.80 ($\$3.30 - \$0.50 = \2.80), compared with \$3.00 before the tax was implemented. Thus, the tax also makes sellers worse off.

To sum up, this analysis yields two lessons:

- Taxes discourage market activity. When a good is taxed, the quantity of the good sold is smaller in the new equilibrium.
- Buyers and sellers share the burden of taxes. In the new equilibrium, buyers pay more for the good, and sellers receive less.

6-2b How Taxes on Buyers Affect Market Outcomes

Now consider a tax levied on buyers of a good. Suppose that our local government passes a law requiring buyers of ice-cream cones to send \$0.50 to the government for each ice-cream cone they buy. What are the effects of this law? Again, we apply our three steps.

Step One The initial impact of the tax is on the demand for ice cream. The supply curve is not affected because, for any given price of ice cream, sellers have the

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same incentive to provide ice cream to the market. By contrast, buyers now have to pay a tax to the government (as well as the price to the sellers) whenever they buy ice cream. Thus, the tax shifts the demand curve for ice cream.

Step Two We next determine the direction of the shift. Because the tax on buyers makes buying ice cream less attractive, buyers demand a smaller quantity of ice cream at every price. As a result, the demand curve shifts to the left (or, equivalently, downward), as shown in Figure 7.

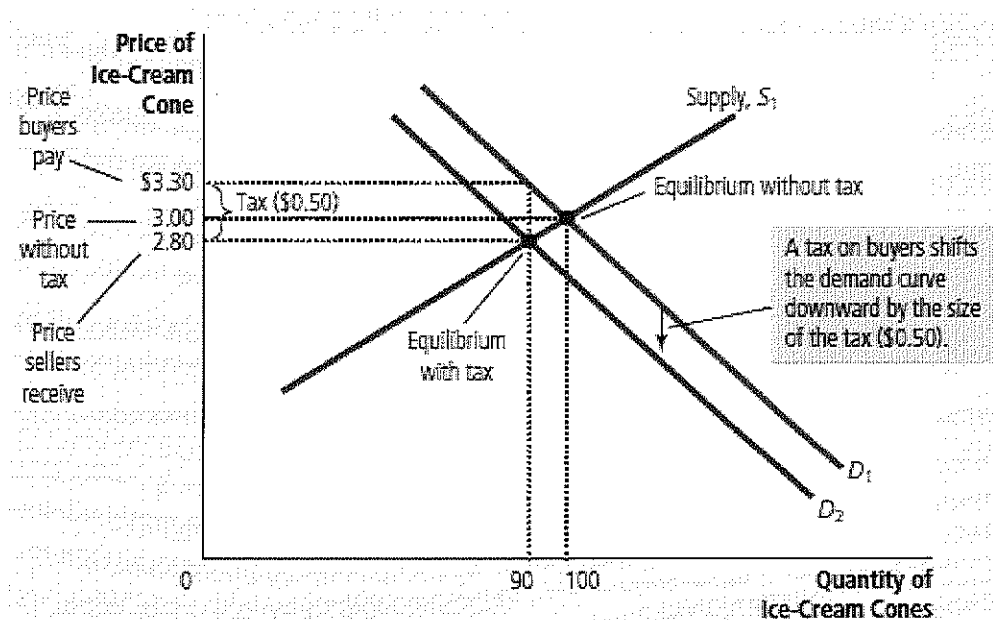
Once again, we can be precise about the size of the shift. Because of the \$0.50 tax levied on buyers, the effective price to buyers is now \$0.50 higher than the market price (whatever the market price happens to be). For example, if the market price of a cone happened to be \$2.00, the effective price to buyers would be \$2.50. Because buyers look at their total cost including the tax, they demand a quantity of ice cream as if the market price were \$0.50 higher than it actually is. In other words, to induce buyers to demand any given quantity, the market price must now be \$0.50 lower to make up for the effect of the tax. Thus, the tax shifts the demand curve *downward* from D_1 to D_2 by the exact size of the tax (\$0.50).

Step Three Having determined how the demand curve shifts, we can now see the effect of the tax by comparing the initial equilibrium and the new equilibrium. You can see in Figure 7 that the equilibrium price of ice cream falls from \$3.00 to \$2.80, and the equilibrium quantity falls from 100 to 90 cones. Once again, the tax on ice cream reduces the size of the ice-cream market. And once again, buyers and sellers share the burden of the tax. Sellers get a lower price for their product; buyers pay a lower market price to sellers than they did previously, but the effective price (including the tax buyers have to pay) rises from \$3.00 to \$3.30.

FIGURE 7

A Tax on Buyers

When a tax of \$0.50 is levied on buyers, the demand curve shifts down by \$0.50 from D_1 to D_2 . The equilibrium quantity falls from 100 to 90 cones. The price that sellers receive falls from \$3.00 to \$2.80. The price that buyers pay (including the tax) rises from \$3.00 to \$3.30. Even though the tax is levied on buyers, buyers and sellers share the burden of the tax.



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Implications If you compare Figures 6 and 7, you will notice a surprising conclusion: *Taxes levied on sellers and taxes levied on buyers are equivalent.* In both cases, the tax places a wedge between the price that buyers pay and the price that sellers receive. The wedge between the buyers' price and the sellers' price is the same, regardless of whether the tax is levied on buyers or sellers. In either case, the wedge shifts the relative position of the supply and demand curves. In the new equilibrium, buyers and sellers share the burden of the tax. The only difference between a tax levied on sellers and a tax levied on buyers is who sends the money to the government.

The equivalence of these two taxes is easy to understand if we imagine that the government collects the \$0.50 ice-cream tax in a bowl on the counter of each icecream store. When the government levies the tax on sellers, the seller is required to place \$0.50 in the bowl after the sale of each cone. When the government levies the tax on buyers, the buyer is required to place \$0.50 in the bowl every time a cone is bought. Whether the \$0.50 goes directly from the buyer's pocket into the bowl, or indirectly from the buyer's pocket into the seller's hand and then into the bowl, does not matter. Once the market reaches its new equilibrium, buyers and sellers share the burden, regardless of how the tax is levied.

case study **Can Congress Distribute the Burden of a Payroll Tax?**

If you have ever received a paycheck, you probably noticed that taxes were deducted from the amount you earned. One of these taxes is called FICA, an acronym for the Federal Insurance Contributions Act. The federal government uses the revenue from the FICA tax to pay for Social Security and Medicare, the income support and healthcare programs for the elderly. FICA is an example of a *payroll tax*, which is a tax on the wages that firms pay their workers. In 2013, the total FICA tax for the typical worker was 15.3 percent of earnings.

Who do you think bears the burden of this payroll tax—firms or workers? When Congress passed this legislation, it tried to mandate a division of the tax burden. According to the law, half of the tax is paid by firms, and half is paid by workers. That is, half of the tax is paid out of firms' revenues, and half is deducted from workers' paychecks. The amount that shows up as a deduction on your pay stub is the worker contribution.

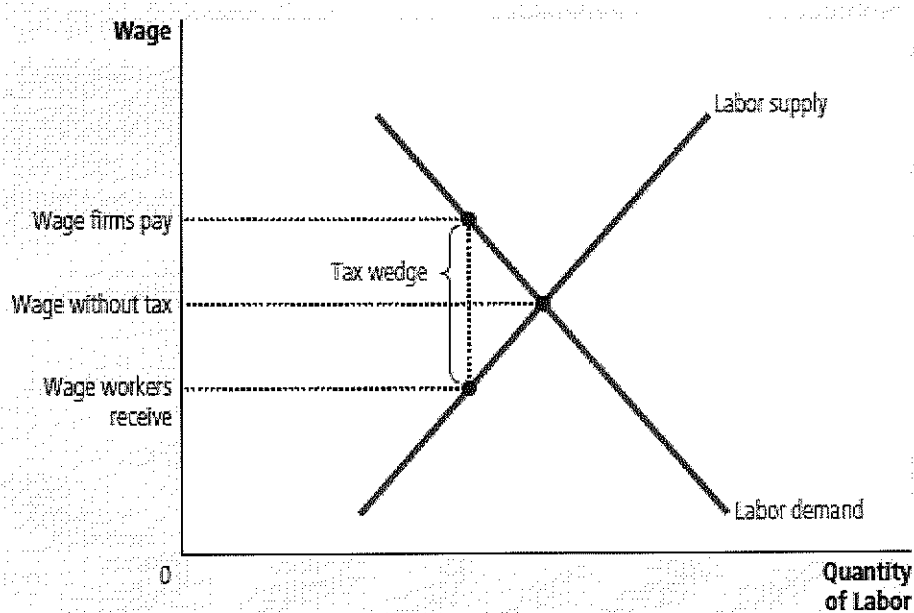
Our analysis of tax incidence, however, shows that lawmakers cannot so easily dictate the distribution of a tax burden. To illustrate, we can analyze a payroll tax as merely a tax on a good, where the good is labor and the price is the wage. The key feature of the payroll tax is that it places a wedge between the wage that firms pay and the wage that workers receive. Figure 8 shows the outcome. When a payroll tax is enacted, the wage received by workers falls, and the wage paid by firms rises. In the end, workers and firms share the burden of the tax, much as the legislation requires. Yet this division of the tax burden between workers and firms has nothing to do with the legislated division: The division of the burden in Figure 8 is not necessarily 50-50, and the same outcome would prevail if the law levied the entire tax on workers or if it levied the entire tax on firms.

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FIGURE 8

A Payroll Tax

A payroll tax places a wedge between the wage that workers receive and the wage that firms pay. Comparing wages with and without the tax, you can see that workers and firms share the tax burden. This division of the tax burden between workers and firms does not depend on whether the government levies the tax on workers, levies the tax on firms, or divides the tax equally between the two groups.



This example shows that the most basic lesson of tax incidence is often overlooked in public debate. Lawmakers can decide whether a tax comes from the buyer's pocket or from the seller's, but they cannot legislate the true burden of a tax. Rather, tax incidence depends on the forces of supply and demand. ▀

6-2c Elasticity and Tax Incidence

When a good is taxed, buyers and sellers of the good share the burden of the tax. But how exactly is the tax burden divided? Only rarely will it be shared equally. To see how the burden is divided, consider the impact of taxation in the two markets in Figure 9. In both cases, the figure shows the initial demand curve, the initial supply curve, and a tax that drives a wedge between the amount paid by buyers and the amount received by sellers. (Not drawn in either panel of the figure is the new supply or demand curve. Which curve shifts depends on whether the tax is levied on buyers or sellers. As we have seen, this is irrelevant for the incidence of the tax.) The difference in the two panels is the relative elasticity of supply and demand.

Panel (a) of Figure 9 shows a tax in a market with very elastic supply and relatively inelastic demand. That is, sellers are very responsive to changes in the price of the good (so the supply curve is relatively flat), whereas buyers are not very responsive (so the demand curve is relatively steep). When a tax is imposed on a market with these elasticities, the price received by sellers does not fall much, so sellers

bear only a small burden. By contrast, the price paid by buyers rises substantially, indicating that buyers bear most of the burden of the tax.

Panel (b) of Figure 9 shows a tax in a market with relatively inelastic supply and very elastic demand. In this case, sellers are not very responsive to changes in the price (so the supply curve is steeper), whereas buyers are very responsive (so the demand curve is flatter). The figure shows that when a tax is imposed, the price paid by buyers does not rise much, but the price received by sellers falls substantially. Thus, sellers bear most of the burden of the tax.

The two panels of Figure 9 show a general lesson about how the burden of a tax is divided: *A tax burden falls more heavily on the side of the market that is less elastic.* Why is this true? In essence, the elasticity measures the willingness of buyers or sellers to leave the market when conditions become unfavorable. A small elasticity of demand means that buyers do not have good alternatives to consuming this particular good. A small elasticity of supply means that sellers do not have good alternatives to producing this particular good. When the good is taxed, the side of the market with fewer good alternatives is less willing to leave the market and must, therefore, bear more of the burden of the tax.

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FIGURE 9

How the Burden of a Tax Is Divided

In panel (a), the supply curve is elastic, and the demand curve is inelastic. In this case, the price received by sellers falls only slightly, while the price paid by buyers rises substantially. Thus, buyers bear most of the burden of the tax. In panel (b), the supply curve is inelastic, and the demand curve is elastic. In this case, the price received by sellers falls substantially, while the price paid by buyers rises only slightly. Thus, sellers bear most of the burden of the tax.

