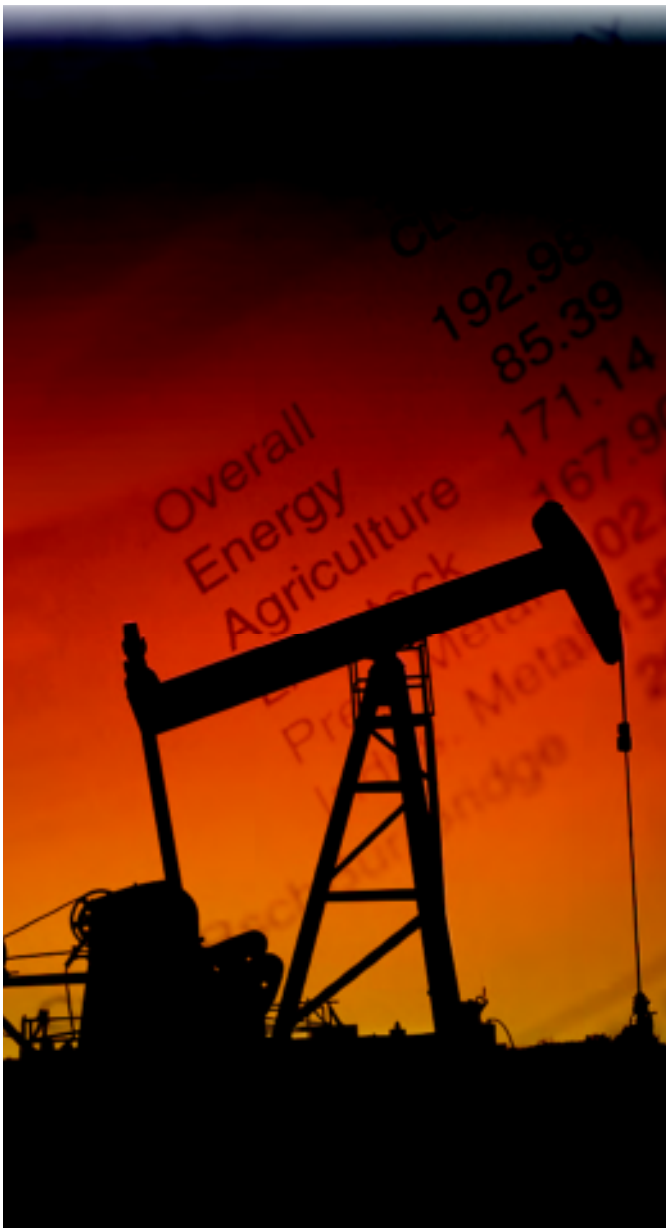
CHAPTER 2

SUPPLY AND DEMAND: THE BASICS



AFTER READING THIS CHAPTER, you will understand the following:

1. How the price of a good or service affects the quantity demanded by buyers
2. How other market conditions affect demand
3. How the price of a good affects the quantity supplied by sellers
4. How other market conditions affect supply
5. How supply and demand interact to determine the market price of a good or service
6. Why market prices and quantities change in response to changes in market conditions
7. What the unintended consequences are of price floors and price ceilings.

BEFORE READING THIS CHAPTER, make sure you know the following concepts:

Spontaneous order

Markets

Opportunity cost

Law of unintended consequences

CHAPTER Outline

Olive oil is the flavorful centerpiece of the healthful and popular Mediterranean diet. Its price can rise or fall sharply from year to year. Although it may not be featured on the nightly news as often as the price of gasoline, it, along with millions of other prices, affects the way we live—our jobs, our incomes, the things we buy, and the things we sell. What determines prices? The short answer is supply and demand.

Economists use the term **supply** to refer to sellers' willingness and ability to provide goods for sale in a market. **Demand** refers to buyers' willingness and ability to purchase goods. This chapter will show how supply and demand work together to determine prices.

2.1 Demand

Supply
The willingness and ability of sellers to provide goods for sale in a market

Demand
The willingness and ability of buyers to purchase goods

Law of demand
The principle that an inverse relationship exists between the price of a good and the quantity of that good that buyers demand, other things being equal

Demand curve
A graphical representation of the relationship between the price of a good and the quantity of that good that buyers demand

According to the **law of demand**, there is an inverse relationship between the quantity of a good that buyers demand and its price. The quantity demanded tends to rise as the price falls and to fall as the price rises. We expect that to happen for two reasons. First, if the price of one good falls while the prices of other goods stay the same, people are likely to substitute the cheaper good. Second, when the price of one good falls while incomes stay the same, people feel a little richer. They use their added buying power to buy a bit more of many things—including, in most cases, a little more of the good whose price went down.

The terms *demand* and *quantity demanded*, as used in economics, are not the same as want or need. For example I think a Porsche® is a beautiful car. Sometimes when I see one on the street, I think, "Hey, I want one of those!" Alas, my income is limited. Although in the abstract I might want a Porsche, there are other things I want more. As a result, the quantity of Porsches I demand at the going price is zero.

On the other hand I might *need* dental surgery to avoid losing my teeth. However, suppose I am poor. If I cannot pay for the surgery or find someone to pay for it on my behalf, I am out of luck. The quantity of dental surgery I demand, therefore, would be zero, however great my need.

Demand, then, combines both willingness and ability to buy. It is not desire in the abstract, but desire backed by the means and the intent to buy.

2.1a The Demand Curve

The law of demand defines a relationship between the quantity of a good that people are willing and able to buy, other things being equal, and the price of that good. Figure 2–1 represents this relationship for a familiar consumer good: chicken. It would be possible to discuss a single consumer's demand for chicken; but, more frequently, we focus on the total demand for the good by all buyers in the market (as in this figure).

The demand curve shows a relationship between the price of a good, such as chicken, and the amount that people are willing and able to buy. (iStock)

The figure shows the demand relationship in two different ways. Start with Part (a). The first row of the table shows that when the price of chicken is $3.00 a pound, the quantity demanded per year is 1.0 billion pounds. Reading down the table, we see that as the price falls, the quantity demanded rises. At $2.50 per pound, buyers are willing and able to purchase 1.5 billion pounds per year; at $1.50, 2.5 billion pounds; and so on.

Part (b) of Figure 2–1 uses a graph, which we call the **demand curve** for chicken, to show the same information in a different way. To use the demand curve to find out what quantity buyers will demand at a price of $2.00 per pound, start at $2.00 on the vertical axis and move across, as shown by the

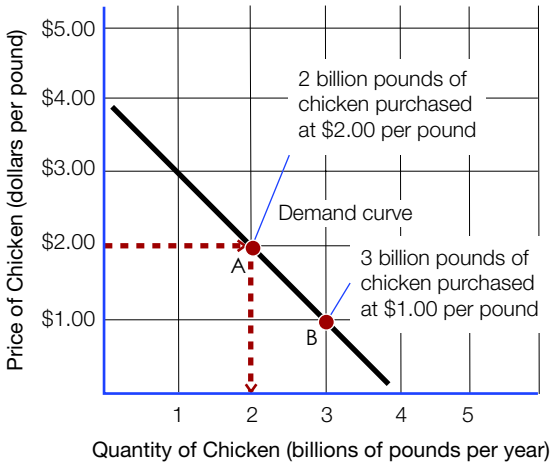
FIGURE 2–1

A Demand Curve for Chicken

(a)

	Price of Chicken (dollars per pound)	Quantity of Chicken Demanded (billions of pounds per year)
	$3.50	0.5
	$3.00	1.0
	$2.50	1.5
A	$2.00	2.0
	$1.50	2.5
B	$1.00	3.0
	$0.50	3.5

(b)



Both the table and the chart show the quantity of chicken demanded at various prices. For example, at a price of $2.00 per pound, buyers are willing and able to purchase two billion pounds of chicken per year. Row A in Part (a) and point A in Part (b) show this price-quantity combination.

arrow, until you reach the demand curve at point A. Then, still following the arrow, drop down to the horizontal axis. Reading from the scale on that axis, you can see that the quantity demanded at a price of $2.00 per pound is 2.0 billion pounds per year. That is the same as the quantity demanded in row A of the table in Part (a).

The effect of a change in the price of chicken, other things being equal, takes the form of a movement from one point to another along the demand curve. Suppose that the price drops from $2.00 to $1.00 per pound. In response, the quantity that buyers plan to buy increases. The point corresponding to the quantity demanded at the new, lower price is point B, which corresponds to row B of the table. Because there is an inverse relationship between price and quantity demanded, the demand curve has a negative slope.

Economists speak of a movement along a demand curve as a **change in quantity demanded**. Such a movement represents buyers' reactions to a change in the price of the good, other things being equal.

Change in quantity demanded

A change in the quantity of a good that buyers are willing and able to purchase that is caused by a change in the price of a good, other things being equal; shown by a movement from one point to another along a demand curve

2.1b Shifts in the Demand Curve

The demand curve[1] in Figure 2–1 shows a relationship between two variables: the price of chicken and the quantity of chicken demanded. Changes in other variables can also affect people's buying decisions. For example the prices of beef and pork would affect the demand for chicken. So would changes in consumer incomes. Changes in expectations about the future and changes in consumer tastes are still other factors that affect

how much chicken people will buy. We could make a similar list for any good or service—the weather affects the demand for ice, the birthrate affects the demand for diapers, the won-lost record of the home team affects the demand for baseball tickets, and so on.

How do we handle all these other variables graphically? In brief, two rules apply.

1. When we draw a single demand curve for a good, such as the one in Figure 2–1, we treat all conditions other than the price of chicken as constant, following the "other things being equal" clause of the law of demand. As long as that clause is in force, the only two variables at work are quantity demanded (on the horizontal axis) and the price of chicken (on the vertical axis). The effect of a change in price on quantity demanded takes the form of a movement along the demand curve.
2. When we look beyond the "other things being equal" clause to discuss the effect of a change in any variable that does not appear on one of the axes, the situation changes. We show the effect of any other variable, such as a change in consumer income or the price of another good, as a shift in the demand curve. In its new position, the demand curve still represents a relationship between the price of chicken and the quantity demanded, but it is a slightly different relationship than before because one of the "other things" is no longer equal.

These two rules for demand curves are crucial to understanding the theory of supply and demand. Let's look at some examples.

Changes in the Price of Another Good

We already know that the demand for chicken depends on the price of beef as well as the price of chicken. Figure 2–2, which shows demand curves for both goods, provides a closer look at how the two prices interact.

Change in demand

A change in the quantity of a good that the buyers are willing and able to purchase that is caused by a change in some condition other than the price of that good; a shift in the demand curve

Suppose that the price of beef starts at $3.00 per pound and then increases to $4.50. The effect of this change on the quantity of beef demanded appears in Part (a) of Figure 2–2 as a movement along the beef demand curve from point A to point B. Part (b) shows the effect on the demand for chicken. With the price of beef higher than before, people will tend to buy more chicken *even if the price of chicken does not change.* Suppose the price of chicken is steady at $2.00 per pound. When beef was selling at $3.00, consumers bought 2.0 billion pounds of chicken a year (point A´ on demand curve D_1). After the price of beef goes up to $4.50, they will buy 3.5 billion pounds (point B´ on demand curve D_2).

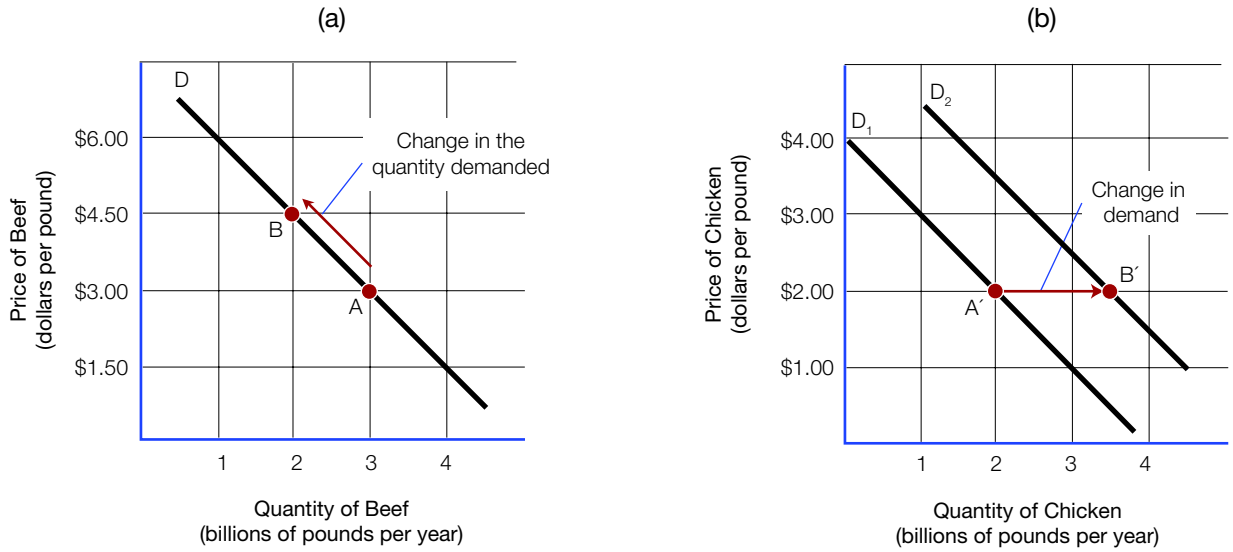
An increase in the price of beef would cause consumers to buy more chicken regardless of the price of chicken. If the price of chicken had started at $3.00 and remained there while the price of beef went up, people would have increased their chicken consumption from 1.0 billion pounds a year to 2.5 billion pounds a year. If the price of chicken were $1.00 a pound, the quantity bought would have increased from 3.0 billion pounds to 4.5 billion, and so on. An economist would say that a change in the price of beef causes the entire demand curve for chicken to shift. The chicken demand curve shifts because one of the "other things," this time the price of beef, is no longer equal. For the new demand curve, D_2, the price of beef is $4.50 a pound, rather than the $3.00 we assumed in drawing demand curve D_1.

A change in the price of gasoline will affect consumer choice between economy cars and SUVs. (Shutterstock)

If we call a movement along a demand curve a "change in quantity demanded," what do we call a shift in the curve? Economists call a shift in a demand curve a **change in demand**. A change in quantity demanded (a movement along the curve) is the result of a change in the price of the good in question—in our example, that means the price of chicken, which is the

FIGURE 2–2

Effects of an Increase in the Price of Beef on the Demand for Chicken



An increase in the price of beef from $3.00 to $4.50 per pound, other things being equal, causes a movement from point A to point B on the beef demand curve—a decrease in the quantity of beef demanded. With the price of chicken unchanged at $2.00 per pound, consumers will substitute chicken for beef. That will cause an increase in the demand for chicken, which takes the form of a shift in the chicken demand curve from D_1 to D_2.

variable on the vertical axis. In contrast, a change in demand (a shift in the demand curve) is the result of a change in some variable other than the price of the good in question. In our example, it was the price of beef, a variable that does not appear on either axis.

In the example in Figure 2–2, people bought more chicken when the price of beef went up, replacing one meat with the other in their dinners. Economists call such pairs of goods **substitutes** because an increase in the price of one increases the demand for the other—a rightward shift in the demand curve.

A different situation arises when consumers tend to use two goods together. One example is cars and gasoline. An increase in the price of gasoline affects people's selection of cars. For example, they buy fewer low-mileage, large SUVs—even if the price of SUVs does not change. An increase in the price of gasoline thus causes a movement upward along the gasoline demand curve and a *leftward shift* in the demand curve for SUVs. We call pairs of goods that have this relationship to one another **complements**.

One more point regarding the effects of changes in the prices of other goods: It is the price of a good *relative to the prices of other goods* that counts for demand. During periods of inflation, when the average level of all prices rises, it is especially important to distinguish between changes in *relative prices* and changes in *nominal prices* (the number of dollars actually paid per unit of a good). During a time of inflation, a good can become relatively less expensive, even though its nominal price rises, if the prices of other goods rise even faster.

Substitute goods
A pair of goods for which an increase in the price of one causes an increase in demand for the other

Complementary goods
A pair of goods for which an increase in the price of one causes a decrease in demand for the other

BVT Lab

Flashcards are available for this chapter at www.BVTLab.com.

For example between 1950 and 2005 the average retail price of broiler chicken rose by almost 40 percent, from $0.59 per pound to $1.05 per pound. Over the same period, the average price of all goods and services rose by about 600 percent. Thus the relative price of chicken fell during the period even though its nominal price rose. The drop in the relative price of chicken had a lot to do with its growing popularity on the dinner table.

Changes in Consumer Incomes

Changes in consumer incomes also affect demand. People tend to buy larger quantities of many goods when their incomes rise, assuming that prices do not change.

Figure 2–3 shows the effect of an increase in consumer income on the demand for chicken. Demand curve D_1 is the same one shown in Figure 2–1. Suppose, now, that consumer income rises. With higher incomes, people throughout the world tend to eat more meat. Increasing income was another factor that made chicken increasingly popular in the decades after World War II.

Suppose that, after their incomes rise, people want to buy 2.5 billion pounds of chicken instead of 1.0 billion at $3.00 per pound. Figure 2–3 shows the change as an arrow drawn from point A to point B. If the price of chicken were instead $2.00, consumers would buy even more chicken at any level of income. When income was at its original low level, consumers would buy 2.0 billion pounds, as shown by point C. After their incomes went up, buyers would want 3.5 billion pounds, shown by point D.

The same reasoning applies for any given price of chicken. As a result, rising income tends to shift the entire demand curve to the right. Later, if consumer incomes stay at the new, higher level but the price changes, the effects would appear as movements along the new demand curve. There is a chicken demand curve for every possible income level. Each represents a one-to-one relationship between price and quantity demanded for that income.

In the example we have just given, an increase in income causes an increase in demand. Because that is what happens for most goods, economists call goods like chicken ,**normal goods**.

Not all goods are normal, however. People buy less of some goods when their incomes rise, other things being equal. For example, as the economy slipped into a deep recession in 2008, sales of new shoes fell, but demand for shoe repair services increased sharply. Hormel Foods Corp. reported a surge in sales of staple products like Spam® and Dinty Moore® beef stew, even while demand for its upscale, single-serving microwaveable foods fell. We call goods like shoe repair services and Spam, for which demand increases as income falls, **inferior goods**. An increase in income shifts the demand curve for an inferior good to the left instead of to the right.

Normal good

A good for which an increase in consumer income results in an increase in demand

Inferior good

A good for which an increase in consumer incomes results in a decrease in demand

Changes in Expectations

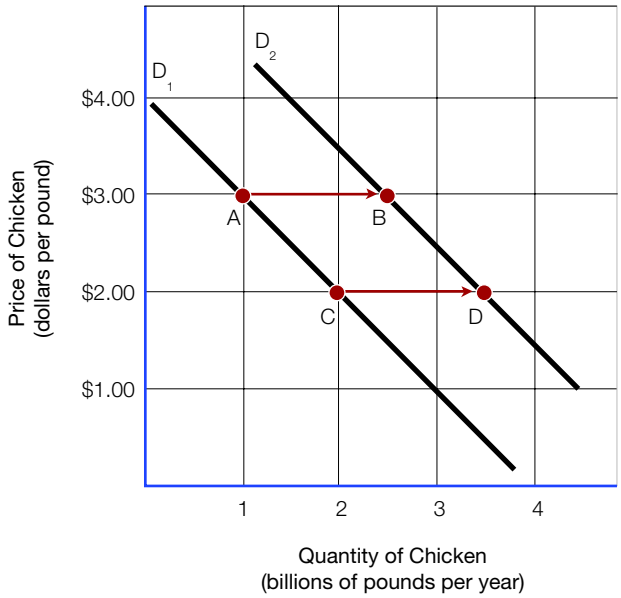
Changes in buyers' expectations can also shift demand curves. If people expect the price of something to go up, they may hurry to buy more before it is too late.

For example, suppose that in May consumers hear that airline prices will go up after June 1. Some of them may be planning to travel late in the summer and would have waited several weeks before booking a flight, but instead, they will book early. The expectation of higher prices later produces a temporary rightward shift in the demand curve before the increase takes effect.

The same thing can happen if people expect something other than a price increase to raise the opportunity cost of the good. For example, in June 2009, a change in rules required US citizens visiting Canada to show a passport—an increase in opportunity cost for people who did not already have one. Some of those people moved their planned Canadian vacations forward to avoid the extra hassle. The result was a temporary surge in demand for Canadian travel.

FIGURE 2–3

Effects of an Increase in Consumer Income on the Demand for Chicken



Demand curve D_1 assumes a given level of consumer income. If incomes increase, consumers will want to buy more chicken at any given price, other things being equal. That will shift the demand curve rightward to, say, D_2. If the prevailing market price at the time of the demand shift is $3.00 per pound, the quantity demanded increases to 2.5 billion pounds (B) from 1.0 billion (A); if the prevailing price is $2.00 per pound, the quantity demanded will increase to 3.5 billion pounds (D) from 2.0 billion (C); and so on.

Changes in Tastes Changes in tastes can also cause an increase or decrease in demand. Sometimes these changes occur rapidly, such as with popular music, clothing styles, and fast foods. In other cases, changes in tastes take longer but are more permanent. For example, over the years, US consumers have been more health conscious. As that has happened, demand has fallen for cigarettes and fatty foods, while demand for fish, organic vegetables, and gym memberships has risen.

As US consumers have become more health conscious, demand for fish, organic vegetables, and gym memberships has increased. (Wikimedia Commons)

2.2 SUPPLY

Let's turn now to the supply side of the market. To continue our earlier example, we change our focus from the quantity that consumers are willing and able to buy under given market conditions to the quantity that producers are willing and able to sell.

As in the case of consumers, we will see that the choices made by producers depend both on the price of the good in question and on other relevant conditions.

2.2a The Supply Curve

We begin with Figure 2–4, which shows the relationship between the price of chicken and the quantity that suppliers are willing and able to sell. We call the relationship shown in the figure a **supply curve** for chicken. The supply curve has a positive slope because the quantity supplied increases when the price goes up. Like demand curves, supply curves are based on an "other things being equal" condition. The supply curve shows how sellers respond to a change in the price of chicken, assuming no changes in the prices of other goods, production techniques, input prices, expectations, or other relevant conditions.

Supply curve
A graphical representation of the relationship between the price of a good and the quantity of that good that sellers are willing to supply

Why do sellers, other things being equal, plan to supply more chicken when the price is higher? Before developing a detailed theory, we can consider some commonsense explanations.

One is that the positive slope of the supply curve represents *producers' responses to market incentives.* When the price of chicken goes up, farmers have a reason to expand their capacity. Some who raise chickens as a sideline may decide to make chickens their main business. Other people may enter the chicken business for the first time. The same reasoning applies in every market. If parents are finding it hard to get babysitters, what

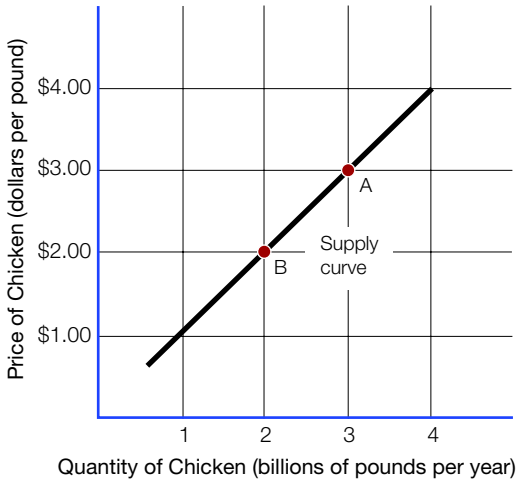
FIGURE 2–4

A Supply Curve for Chicken

(a)

	Price of Chicken (dollars per pound)	Quantity of Chicken Supplied (billions of pounds per year)
	$4.00	4.0
	$3.50	3.5
A	$3.00	3.0
	$2.50	2.5
B	$2.00	2.0
	$1.50	1.5
	$1.00	1.0

(b)



Parts (a) and (b) of this figure show the quantity of chicken supplied at various prices. As the price rises, the quantity supplied increases, other things being equal. The higher price gives farmers an incentive to raise more chickens, but the rising opportunity cost of doing so limits the supply produced in response to any given price increase.

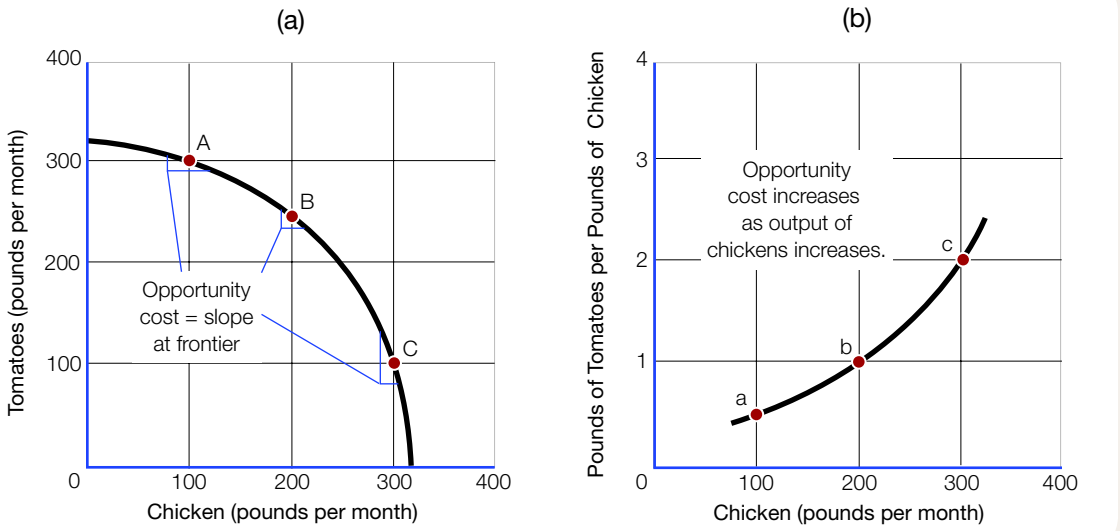
do they do? They offer a bigger incentive in the form of a higher hourly rate. If a sawmill cannot buy enough timber, it raises the price it offers to loggers, and so on. Exceptions to the rule that a higher price causes a greater quantity supplied are rare.

Instead, we could explain the positive slope of the supply curve in terms of the *rising cost of producing additional output in facilities of a fixed size.* A furniture factory with a fixed amount of machinery might be able to produce more chairs only by adding shifts or paying overtime. A farmer trying to grow more wheat on a fixed amount of land could increase the use of fertilizer; but beyond a point, each added ton of fertilizer would yield less additional output.

Finally, we can explain the positive slope of the supply curve in terms of *comparative advantage and opportunity cost*. Part (a) of Figure 2–5 shows a production possibility frontier for an economy that produces tomatoes and chicken. Some farmers have a comparative advantage in one product; some, in the other. Suppose we start from a point where farmers produce only tomatoes and then introduce chicken. The first farmers to

FIGURE 2–5

The Production Possibility Curve and the Supply Curve



This figure offers an interpretation of the supply curve in terms of the production possibility frontier for an economy that produces two goods: tomatoes and chicken. Part (a) shows a production possibility frontier. The slope of the frontier, at any point, shows the opportunity cost of producing an additional pound of chicken measured in terms of the quantity of tomatoes that farmers could have produced using the same factors of production. The frontier curves because some farmers have a comparative advantage in producing tomatoes and others have a comparative advantage in producing chicken. As farmers raise more chicken, those with the greatest comparative advantage are the first to stop producing tomatoes. Because the frontier gets steeper as the quantity of chicken increases, the opportunity cost rises, as shown in Part (b). We can interpret the curve in Part (b) as a supply curve, in the sense that an incentive, in the form of a higher price, will cause producers to shift factors from tomatoes to chicken despite the rising opportunity cost of chicken.

switch to chicken will be those with the strongest comparative advantage—that is, those able to produce chicken at the lowest opportunity cost relative to tomatoes. They will be willing to switch from tomatoes to chicken even if the price of chicken is low. As farmers add more and more chicken, the point of production moves down and to the right along the frontier. After each adjustment, the price of chicken must rise further to give the needed incentive for farmers with higher opportunity costs to make the switch.

The slope of the frontier at any point represents the price of chicken, relative to the price of tomatoes, that will cause one more farmer to switch. Part (b) of Figure 2–5 uses information on opportunity costs, based on the slope of the frontier at points like A, B, and C, to construct a supply curve for chicken. That curve shows how the price of chicken must rise relative to the price of tomatoes to induce more farmers to switch from one product to the other.

Each of these commonsense explanations fits certain circumstances. Together, they provide an intuitive basis for the positive slope of the supply curve.

2.2b Shifts in the Supply Curve

We call the effects of a change in the price of chicken, other things being equal, a **change in quantity supplied**, shown as a movement along the supply curve. The effects of a change in a condition other than the price of chicken are known as a **change in supply**, shown as a shift in the supply curve. Four sources of change in supply are worth noting. Each of them reflects a change in the opportunity cost of producing the good or service in question.

Changes in Technology

A given supply curve is based on a given technology. Entrepreneurs are constantly looking for new ways of doing things that lower costs. When production costs fall, it becomes worthwhile to sell more of the good at any given price. Figure 2–6 shows how new technology affects the supply curve for chicken.

Supply curve S_1 is the same as the one shown in Figure 2–4. It indicates that farmers will plan to supply 3.0 billion pounds of chicken per year at a price of $3.00 per pound (point A). Now suppose that the development of a faster-growing bird reduces feed requirements. With lower costs per unit, farmers will be willing to supply more chicken at any given price. They may, for example, be willing to supply 4.0 billion pounds of chicken at $3.00 (point B). The move from A to B is part of a shift in the entire supply curve from S_1 to S_2. Once the new methods of production are established, any increase or decrease in the price of chicken, other things being equal, will cause a movement along the new supply curve.

Change in quantity supplied
A change in the quantity of a good that suppliers are willing and able to sell that is caused by a change in the good's price, other things being equal; shown by a movement along a supply curve

Change in supply
A change in the quantity of a good that suppliers are willing and able to sell that is caused by a change in some condition other than the good's price; shown by a shift in the supply curve

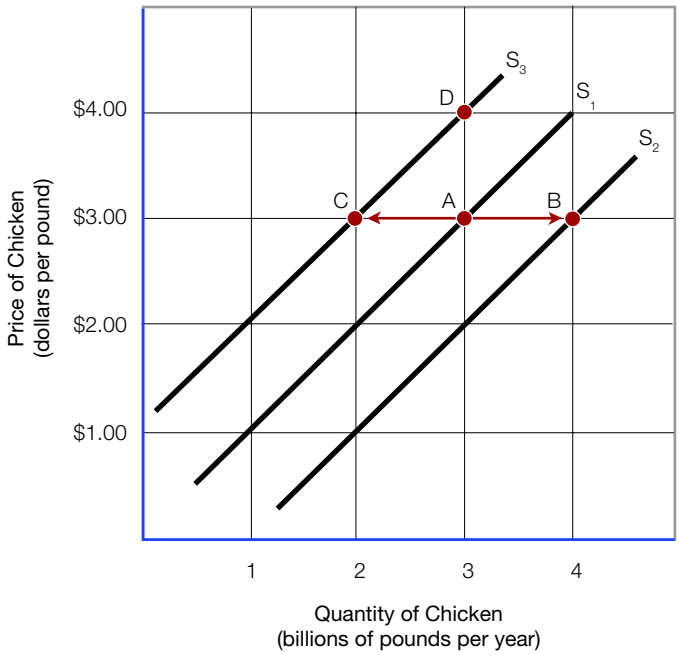
Changes in Input Prices

Changes in input prices are a second item that can cause supply curves to shift. An increase in input prices, other things being equal, increases the cost of producing the good in question and reduces quantity supplied at any given price. Refer again to Figure 2–6. Suppose that, starting from point A on supply curve S_1, the price of chicken feed increases and no offsetting changes occur. Now, instead of supplying 3.0 billion pounds of chicken at $3.00 per pound, farmers will supply just 2.0 billion pounds (point C). The move from A to C is part of a leftward shift in the supply curve, from S_1 to S_3.

If the price of feed remains at the new level, changes in the price of chicken will cause movements along the new supply curve. For example farmers could be induced to supply the original quantity of chicken—3.0 billion pounds—if the price of chicken were raised enough to cover the increased cost of feed. As you can see in Figure 2–6, that would require a price of $4.00 per pound for chicken (point D).

FIGURE 2–6

Shifts in the Supply Curve for Chicken



Several kinds of changes can cause the supply of chicken to increase or decrease. For example a new production method that lowers costs will shift the curve to the right, from S_1 to S_2, because producers will be willing to supply more at any given price. An increase in the price of inputs, other things being equal, will shift the curve to the left, from S_1 to S_3. Changes in sellers' expectations or in the prices of competing goods can also cause the supply curve to shift.

Changes in the Prices of Other Goods

Changes in the prices of other goods that producers could make using the same factors of production can also shift the supply curve. In our earlier example, farmers could use available resources for either chickens or tomatoes. Suppose that the price of tomatoes rises while the price of chicken stays at $3.00. The higher price of tomatoes gives some farmers who would otherwise have produced chickens an incentive to shift to tomatoes. The result would be a leftward shift in the chicken supply curve.

Changes in Expectations

Changes in producers' expectations are a third factor that can cause supply curves to shift. For example a farmer's selection of crops depends less on the price at planting time than on that expected at harvest. Expectations over a time span also matter. Each crop requires special equipment and know-how. We have just seen that an increase in the price of tomatoes gives farmers an incentive to shift from chicken to tomatoes. The incentive will be stronger if they expect the price of tomatoes to remain high, making it worthwhile to buy special equipment and learn the necessary production techniques.

2.3 The Interaction of Supply and Demand

Markets transmit information, in the form of prices, to people who buy and sell. Buyers and sellers take those prices into account, along with other knowledge they have, when making the plans that shape the supply and demand curves.[2]

Nothing guarantees that all of the buyers and sellers in a market will be able to carry out their plans, as hoped, when they meet to trade. Perhaps the quantity of a good that buyers want is greater than the quantity suppliers are willing to sell at the prevailing price. In that case, some of the would-be buyers will be disappointed and must change their plans. Perhaps planned sales exceed planned purchases. In that case, some would-be sellers will have to adjust their plans. Sometimes, though, buyers' and sellers' plans will exactly mesh when they meet in the marketplace; no one is disappointed or needs to change plans. In that case, the market is in **equilibrium**.

Equilibrium
A condition in which buyers' and sellers' plans exactly mesh in the marketplace, so that the quantity supplied exactly equals the quantity demanded at a given price

Excess quantity demanded (shortage)
A condition in which the quantity of a good demanded at a given price exceeds the quantity supplied

Inventory
A stock of a good awaiting sale or use

2.3a Market Equilibrium

We can illustrate a state of market equilibrium by drawing both the supply and demand curves for a good on one diagram. Figure 2–7 does that for the chicken market. If we compare the quantity of planned sales at each price with the quantity of planned purchases, we can see that there is only one price where the two sets of plans mesh. (We can use either the table or the graph to make the comparison.) That price—$2.00 per pound—is the equilibrium price. If all buyers and sellers make their plans with the expectation of a price of $2.00, no one will be surprised and no one will have to change their plans.

2.3b Shortages

What would happen if people were to base their plans on a price other than $2.00 a pound?[3] Suppose, for example, that they plan for a price of $1.00. As Figure 2–7 shows, planned purchases at that price are 3.0 billion pounds per year, but farmers plan to supply only 1.0 billion. When the quantity demanded exceeds the quantity supplied, the difference is an **excess quantity demanded** or, more simply, a shortage. In Figure 2–7, the **shortage** at a price of $1.00 is 2.0 billion pounds per year.

In most markets, the first sign of a shortage is a decrease in **inventories**—that is, in previously produced stocks of a good that are ready for sale or use. Sellers normally plan to hold a certain level of inventory to allow for minor changes in demand. When they see inventories dropping below the planned level, they change their plans. Some sellers may try to rebuild their inventories by increasing their output. Others may take advantage of strong demand to raise prices. Many are likely to do a little of both. As sellers adjust their plans, they will move upward and to the right along the supply curve.

As the price begins to change, buyers, too, adjust their plans. They cut back on their planned purchases, moving up and to the left along the demand curve. As both buyers and sellers adjust, the market moves toward equilibrium. When the price reaches $2.00, the shortage disappears, along with the pressure to make further adjustments in plans.

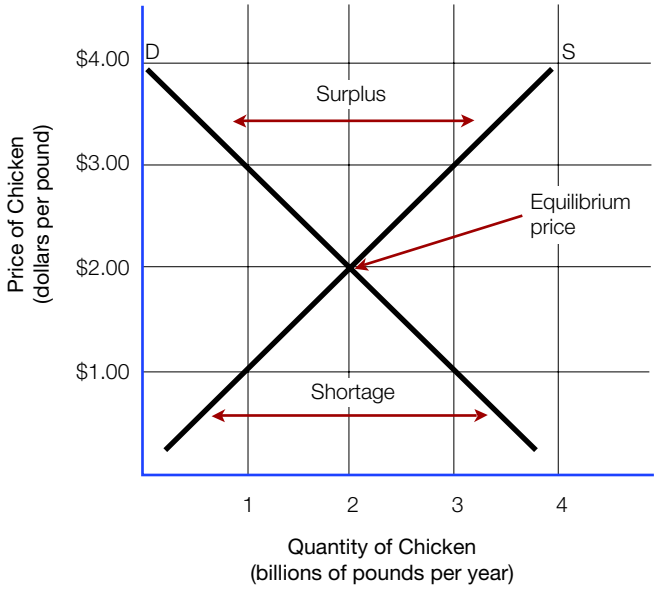
In the markets for services—knee surgery, tax preparation, lawn care, and the like—the adjustment process is a little different because there are no inventories of services produced but not yet sold. The same is true of goods like custom-built houses and custom-designed machine tools, where producers do not begin work until they have a contract with a buyer.

A line of people waiting to buy something is a sign of shortage. (Dreamstime)

FIGURE 2–7

Equilibrium in the Chicken Market

(a)



(b)

Price (per pound)	Quantity Demanded (billions of pounds)	Quantity Supplied (billions of pounds)	Shortage (billions of pounds)	Surplus (billions of pounds)	Direction of Pressure on Rice
$3.50	0.5	3.5	—	3.0	Downward
$3.00	1.0	3.0	—	2.0	Downward
$2.50	1.5	2.5	—	1.0	Downward
$2.00	2.0	2.0	—	—	Equilibrium
$1.50	2.5	1.5	1.0	—	Upward
$1.00	3.0	1.0	2.0	—	Upward
$0.50	3.5	0.5	3.0	—	Upward

This figure shows the supply and demand curves for chicken presented earlier in graphical and numerical form. The demand curve shows how much buyers plan to purchase at a given price. The supply curve shows how much producers plan to sell at a given price. At only one price ($2.00 per pound) do buyers' and sellers' plans exactly match. That is the equilibrium price. A higher price causes a surplus of chicken and puts downward pressure on price. A lower price causes a shortage and puts upward pressure on price.

In markets where there are no inventories, the first sign of a shortage is a queue of buyers. The queue may take the form of a line of people waiting for service or a list of names in an order book. The queue is a sign that, at the prevailing price, people would like to buy more of the good than is being supplied. In that case, buyers cannot carry out all of their plans—at least not right away.

The formation of a queue of buyers has the same effect on the market as a decrease in inventories. Sellers react by increasing output, raising prices, or both. Buyers react by reducing purchases or by offering higher prices. The market moves up and to the right along the supply curve and, at the same time, up and to the left along the demand curve until it reaches equilibrium.

2.3c Surpluses

Suppose, instead, that buyers and sellers expect a price that is above the equilibrium. For example, in Figure 2–7, if the expected price is $2.50 per pound, farmers will plan to supply 2.5 billion pounds of chicken, but their customers will plan to buy only 1.5 billion pounds. When that happens, there is an **excess quantity supplied**, or a **surplus**. Here, the surplus at $2.50 per pound is 1.0 billion pounds per year.

Taxi queues indicate a surplus of sellers looking for customers. (Wikimedia Commons)

If there is a surplus, suppliers will not be able to sell all they had hoped at the expected price. Inventories will start to grow. Suppliers will react to the inventory buildup by changing their plans. Some will cut back their output. Others will lower their prices in the hope of getting customers to buy more. Still others will do a little of both. Those changes in plans will cause a movement down and to the left along the supply curve.

As unplanned inventory buildup puts downward pressure on the price, buyers change their plans, too. Finding that chicken costs less than they had expected, they buy more of it. Figure 2-7 shows that reaction as a movement down and to the right along the demand curve. Taken together, buyers' and sellers' reactions to the surplus bring the market into equilibrium.

In markets in which there are no inventories, surpluses lead to queues of sellers looking for customers. Taxi queues at airports are a case in point. At some times of the day, the fare for taxi service from the airport to downtown is more than high enough to attract all the taxis needed to meet demand. A queue of cabs waiting for passengers then forms. If there are rules against fare cutting, as there are in many traditional taxi services, the queue continues to grow until the next peak period when a surge in demand shortens it. In contrast, nontraditional ride services like Uber adjust prices flexibly as weather, traffic, and other conditions change.

2.3d Changes in Market Conditions

Finding the equilibrium price and quantity looks easy enough in our examples, but in real life, it is a moving target. The market conditions that fall under the "other things being equal" proviso change frequently. When they do, both buyers and sellers must revise their plans, and the equilibrium price and quantity change.

Excess quantity supplied (surplus)
A condition in which the quantity of a good supplied at a given price exceeds the quantity demanded

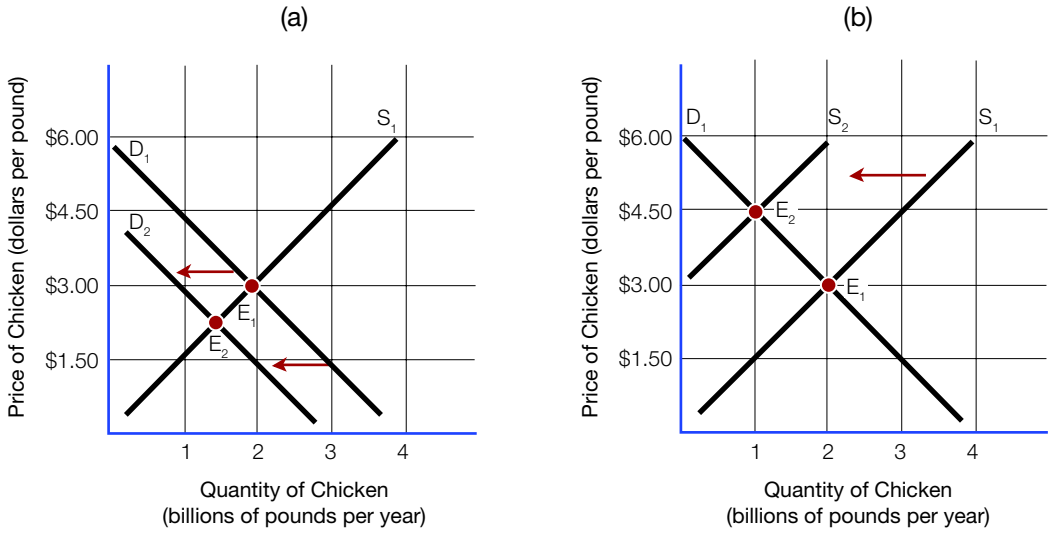
Response to a Shift in Demand

Let's start by looking at how a market responds to a shift in demand. Suppose you hear on Twitter that there has been an outbreak of food poisoning linked to chicken. As the news spreads, the demand for chicken decreases. Part (a) of Figure 2–8 shows that as a leftward shift of the demand curve.

After the decrease in demand, there will be a surplus at the original price of $3.00. The price will not stay at that level for long, though. As soon as inventories start to rise, producers begin to revise their plans. They cut their prices and reduce quantities supplied. Suppliers'

FIGURE 2–8

Effects of Changing Conditions in the Chicken Market



Part (a) of this figure shows the effects of a decrease in demand for chicken caused by reports linking food poisoning to eating chicken. Initially the market is in equilibrium at E_1. The report shifts the demand curve. At the original equilibrium price of $3.00, there is a temporary surplus of chicken. That causes inventories to rise and puts downward pressure on the price. As the price falls, producers move down along the supply curve to a new equilibrium at E_2. There, both the price and quantity of chicken are lower than before the shift in demand. Part (b) shows the effects of a decrease in supply caused by an increase in the price of chicken feed. The shift in the supply curve causes a shortage at the initial price of $3.00 per pound. The shortage puts upward pressure on price. As the price rises, buyers move up and to the left along the demand curve until they reach a new equilibrium at E_2. In each case, note that only one curve needs to shift to bring about the new equilibrium.

reactions appear as a movement along the supply curve, not as a shift in the curve, because the producers are responding to a change in the price of chicken—the variable shown on the vertical axis. Nothing has happened to change the "other things being equal" conditions, such as technology or input prices, which could cause the supply curve to shift.

Adjustments continue until the plans of suppliers once again mesh with those of consumers. That happens at point E_2 in Part (a) of Figure 2–8, where the price has fallen to $2.25 and the quantity sold to 1.5 billion pounds. Later, if the conditions that caused the health warning disappear, the demand curve will shift back to D_1, and the market will return to its original equilibrium.

Response to a Shift in Supply

In another case, the market equilibrium might be upset by a change in supply rather than demand. For example, suppose that increased use of corn to make ethanol pushes up the price of chicken feed. That would shift the supply curve for chicken to the left, while the demand curve remains unchanged, as shown in Part (b) of Figure 2–8.

The shift in the supply curve would cause a shortage if the price of chicken remained unchanged at $3.00 per pound. Inventories would fall, putting upward pressure on the price. Producers would increase the amount they planned to sell, moving upward and to the right along the new supply curve. Buyers would move upward and to the left along the demand curve. A new equilibrium would be established when the price reached $4.50.

A Shift in One Curve or Both? One of the most common mistakes people make in using supply and demand is to think that *both* curves always must shift in order to restore equilibrium. The examples given in Figure 2–8 show why they do not. As Part (a) shows, after the demand curve shifts, the market moves along the supply curve to reach the new equilibrium. The supply curve does not need to shift. Similarly, in Part (b), where the supply curve shifts, the market moves along the demand curve to reach the new equilibrium.

However, in the turmoil of real-world markets, it is easy to find cases where two separate changes occur at the same time, one acting on supply and the other on demand. *Economics in the News 2.1* provides an example: the way both demand and supply conditions affect prices for cocoa. In that market, a steady rightward shift in the demand curve has led to a long-term trend toward higher prices. Superimposed on the long-term demand-driven trend are short-term changes in supply caused by changes in other conditions.

No central authority has to plan the process of adjustment. Equilibrium is not a compromise negotiated by a committee of consumers and producers. Just as shoppers manage to equalize the length of supermarket checkout lines without the guidance of a central authority, markets like that for cocoa move toward equilibrium spontaneously through the small, local adjustments that people make in their efforts to serve their own interests. As Adam Smith might have put it, we have not the benevolence of the International Cocoa Organization to thank for our dessert; instead it is self-interest that puts that box of chocolates on the table.

Economics in the News 2.1

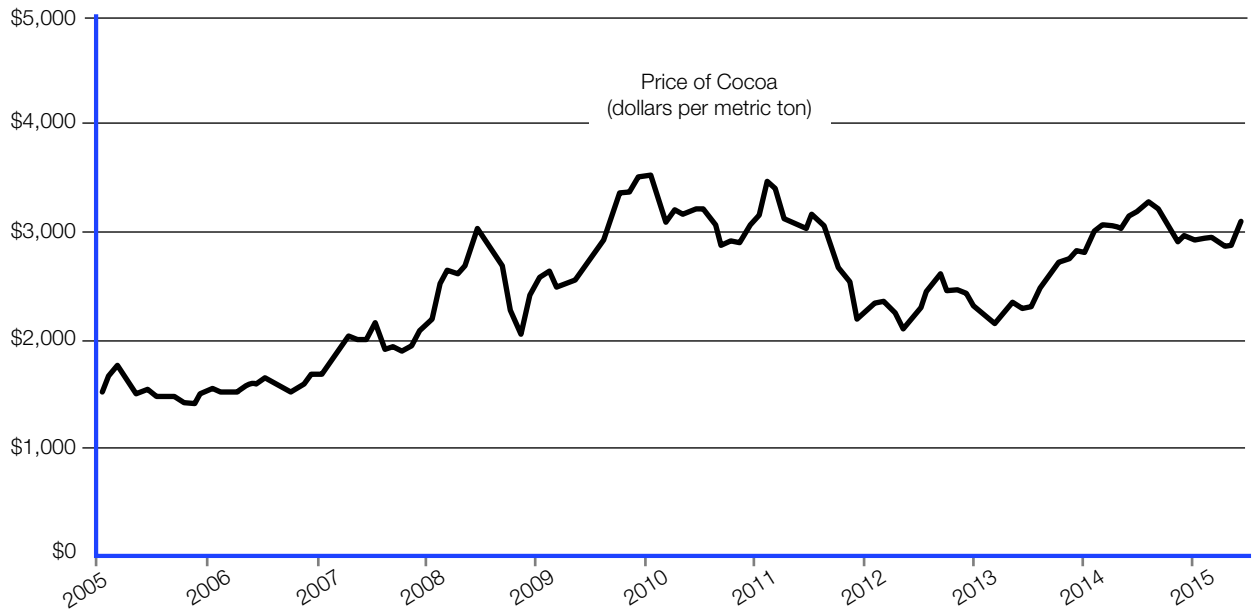
Chocolate Lovers Keep Nervous Eye on Cocoa Prices

Supply and demand have driven the prices of cocoa, the main ingredient in chocolate, to record highs in recent years. Prices have not only been high but also increasingly volatile.

Changing demand conditions are responsible for much of the upward trend in prices in recent decades. Since chocolate is a normal good, the hundreds of millions of new middle-class consumers in developing countries buy more chocolate as their incomes rise. Changing tastes also play a role. For example until recently, chocolate was not especially popular in China, even among those who could afford it. Per capita consumption was some one hundred times less than in Europe and the United States—a far bigger difference than income alone could explain. Now Chinese consumers are starting to see chocolate as trendy. Consumption has been growing by more than 10 percent per year.

Both rising incomes and changing tastes have shifted the chocolate demand curve to the right. Even if supply conditions had remained unchanged, the shift in demand by itself would be enough to push the price of cocoa steadily higher.

In practice, though, supply conditions do change, often more rapidly than demand. Political conflicts are one source of change. For example in 2010, a disputed election in Ivory Coast, the world's largest cocoa producer, threw the market into turmoil. A spiraling civil war disrupted exports, shifting the world supply curve to the left and causing a spike in world prices. When the crisis was finally resolved in April 2011, normal supply conditions returned and prices fell again.



Data source: http://www.icco.org/statistics/cocoa-prices/monthly-averages.html

Also the cocoa supply, like that of any farm product, is subject to changes in growing conditions. Cocoa crops throughout West Africa suffer from periodic outbreaks of swollen shoot disease. The leaves of affected trees turn red, and the cocoa pods are ruined. In the summer of 2011, just as a return of political calm allowed the cocoa price to fall a bit, a new outbreak of swollen shoot disease shifted the supply curve to the left once again, pushing the price back up.

In 2014, a new disaster struck West Africa, this time in the form of an Ebola epidemic. To prevent the spread of the disease from neighboring Liberia and Guinea, Ivory Coast closed its borders, cutting off an important supply of labor to harvest its cocoa crop. The labor shortage and fear of contagion sent prices higher again.

The bottom line? You may have to get ready to pay more for your chocolate—or you may not. Any way you look at it, the complexities of supply and demand are likely to keep chocolate prices volatile. But look at the bright side. If high chocolate prices depress you, just remember that chocolate itself is a reliable cure for depression!

Source: http://www.icco.org/statistics/cocoa-prices/monthly-averages.html

2.4 Price Floors and Ceilings

The previous section discussed how temporary surpluses and shortages cause prices and output to change when market conditions change. Sometimes, however, government regulations impose price floors or ceilings that interfere with free adjustment of prices. Surpluses and shortages then become persistent, often resulting in unintended consequences for producers, consumers, and taxpayers. This section uses the supply and demand model to analyze the effects of government-imposed price floors and ceilings and provides some examples.

2.4a Price Supports: The Market for Milk

In our earlier example of the market for chicken, a decrease in demand caused a surplus that, in turn, caused the price to decrease until the surplus disappeared. Markets have not always been free to respond by adjusting prices, however. The market for milk is one such case.

Figure 2–9 shows the market for milk in terms of supply and demand curves. The horizontal axis shows the quantity of milk in hundredweight, the unit used for bulk milk sales, equal to roughly twelve gallons. Suppose that, initially, the market is in equilibrium at point E_1. The wholesale price of milk is $13 per hundredweight, and the output is 110 million hundredweight per year. Then suppose that a trend in taste away from high-cholesterol foods shifts the demand curve for milk to the left. The result would be a surplus of milk at the $13 price, as shown by the arrow in Figure 2–9.

If the price of milk were free to fall in response to a surplus, the market would quickly reach a new equilibrium at $10 per hundredweight. However, suppose that the government sets a minimum price of $13 and enforces it by agreeing to buy all of the milk that farmers cannot sell at that price. With the demand curve in its original position, D_1, there was no surplus, and the government did not need to buy any milk. However, with the demand curve in position D_2, there is a surplus of forty million hundredweight per year. The result is a persistent surplus.

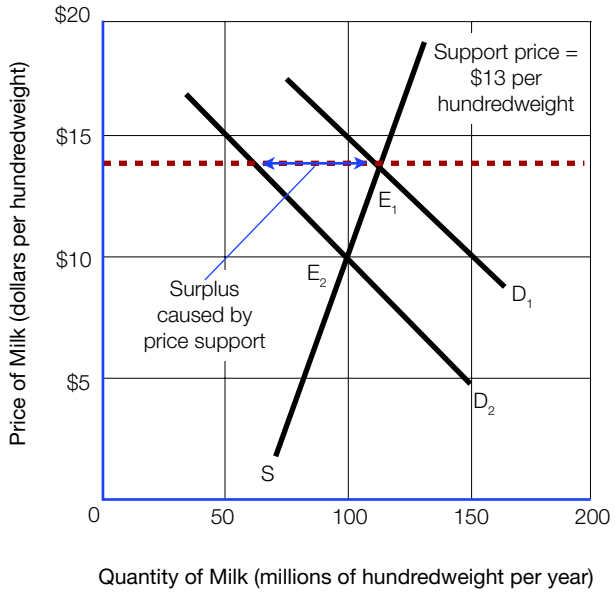
In effect, the price floor sends conflicting signals to producers and consumers. To consumers, the price of $13 says, "Milk is scarce. Its opportunity cost is high. Hold your consumption down." To producers, it says, "All is well. Incentives are unchanged. Feel free to continue using scarce resources to produce milk." Without the price supports, a drop in the price to $10 would send a different set of messages. Consumers would hear, "Milk is cheaper and more abundant. Although it is not cholesterol free, give in to temptation! Drink more of it!" Producers would hear, "The milk market is not what it once was. Look at your opportunity costs. Is there perhaps some better use for your labor, capital, and natural resources?"

Congress established the original milk price support program in 1949. For most of its first fifty years, the price floor was consistently higher than the equilibrium price. By the 1990s, the program became very expensive—more than $1,000 per US family by some estimates, enough to buy each family its own cow. From time to time, Congress attempted to control program costs without harming dairy interests.

One idea was to shift the supply curve to the left so that it would intersect the demand curve near the support price by encouraging farmers to sell their cows for slaughter. However, that and other supply-side efforts failed to eliminate the milk surplus. That was, in part, because a high milk price encouraged entrepreneurial efforts by dairy farmers in the form of improved breeding, use of hormones and antibiotics, and automated farm management practices, all of which increased milk output per cow.

FIGURE 2–9

Price Supports for Milk



The market for milk is in equilibrium at E_1. A change in tastes away from high-cholesterol foods then shifts the demand curve to D_2. If the price were free to fall, a temporary surplus would push the price down to a new equilibrium at $10 per hundredweight. Instead suppose that the government maintains a support price for milk at a level higher than the equilibrium price, as it did for many years ($13 per hundredweight in this example). The government would then need to buy the surplus milk and store it in the form of powdered milk, butter, and cheese to keep the price from falling.

Then, during the early years of the twenty-first century, conditions in the milk market changed. Increasing demand from emerging-market countries and rising feed costs caused shifts in both supply and demand curves. By 2005, the support price had fallen below the market price, and the surplus had disappeared. By 2014, changing market conditions plus renewed political pressure to cut government spending finally led to the end of milk price supports. Dairy interests did not come away entirely empty-handed. Farmers received the opportunity to buy into a program that protects their profit margins against any squeeze from a simultaneous fall in milk prices and rise in feed prices. However, it appears that artificially high prices and persistent surpluses have become a thing of the past.

2.4b Price Ceilings: The Case of Rent Control

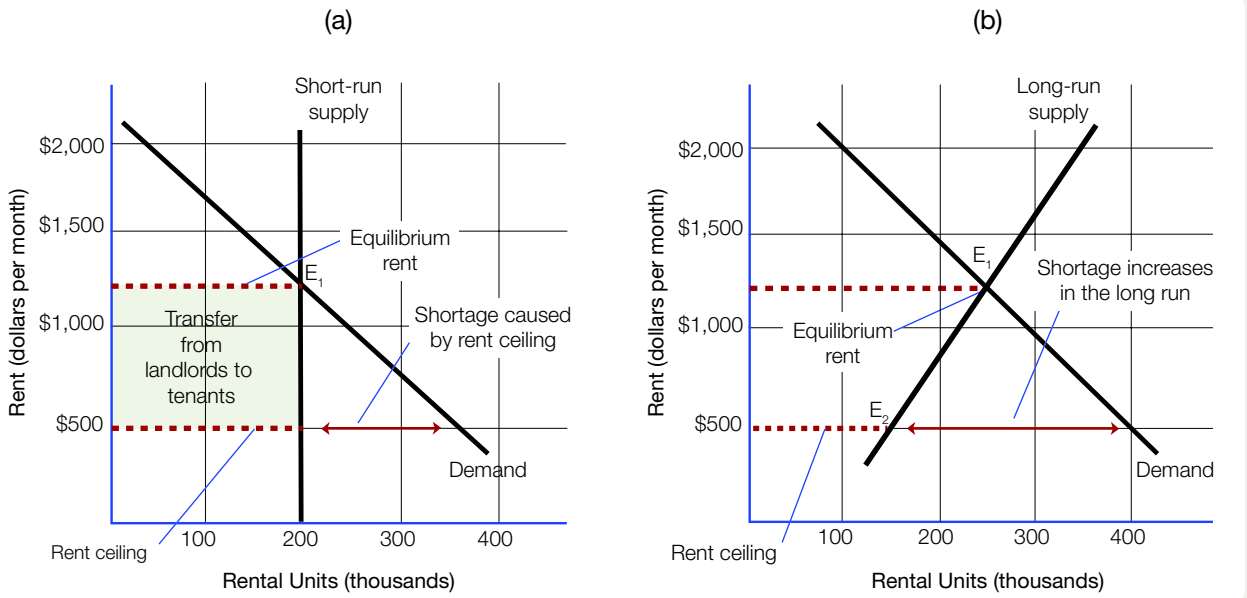
Milk price controls established a price floor that was higher than the market equilibrium. In other markets policy has, instead, imposed a price ceiling below the equilibrium. Consider the case of rent control in housing markets.

Several cities, including New York, Los Angeles, San Francisco, and Washington, DC, have used rent control in one form. The ostensible aim is to aid tenants by preventing landlords from charging "unreasonably high" rents. However, what should be considered unreasonably high is determined by the relative political strength of landlords and tenants rather than by the forces of supply and demand.

Intended Effects Figure 2–10 interprets the effects of rent control in terms of supply and demand. (For simplicity, we assume that housing units have equal size and rental value.) Part (a) of the figure shows the effects of rent control in the short run. Here the short run means a period that is too short to permit significant increases or decreases in the supply of rental housing, making the short-run supply curve a vertical line.

FIGURE 2–10

Effects of Rent Control



Part (a) shows the short-run effects of rent control. In the short run the supply of rental apartments is fixed. The equilibrium rent is $1,250 per month. Authorities then impose a rent ceiling of $500 per month. One possible outcome is that landlords will charge disguised rent increases, which will bring the true price back to $1,250 per month. If regulations prohibit such disguised increases, there will be a shortage of 350,000 units at the ceiling price. Part (b) shows the long-run effects, when there is time to adjust the number of units in response to the price. With the ceiling in effect, landlords move down their supply curve to E_2. The shortage then becomes even more severe than in the short run.

Under the conditions shown, the equilibrium rent per standard housing unit is $1,250 per month for each of the two hundred thousand units in the city. Now suppose that authorities impose a rent ceiling of $500. At that price, tenants would save $750 per unit per month. The total sum transferred to tenants in the form of below-market rents is $750 multiplied by two hundred thousand units, or $150 million, equal to the area of the shaded rectangle.

Unintended Effects Unfortunately for tenants, rent control also produces unintended consequences. In the short run, when the stock of apartments is fixed, the unintended consequences stem from the apartment shortage created because the quantity demanded is greater at the lower ceiling price than at the higher equilibrium price. Quantity demanded increases, in part, because some people who would otherwise own a house or condominium might prefer to seek rent-controlled units in the city instead of living in suburbs without rent control.

The shortage creates a problem for both landlords and tenants: How will the limited supply of apartments be rationed among those who want them? Both landlords and tenants devise a number of creative responses—*entrepreneurial* responses, as an economist would say.

One response on the part of landlords is to seek disguised rent increases—for example requiring large, nonrefundable deposits, selling used furniture or appliances at inflated prices as a condition for renting the apartment, or overcharging for maintenance or security services. Tenants, too, may get into the act. When they decide to move, they may sublet their apartments to other tenants rather than give up their leases. Now it is the tenant who collects the deposits or sells the old furniture to the subtenant. The original tenant may have moved to a distant city but maintains a bank account and a post office box for use in paying the rent. The subtenant is instructed to play the role of a "guest" if the landlord telephones.

Advocates of rent control view these responses as cheating and often try to outlaw them. If prohibitions are enforced, the landlord will find that there are many applicants for each vacant apartment. In that case the landlord must decide to whom to rent the apartment. The result will often be discrimination against renters who are from minority groups, who have children, or who have unconventional lifestyles.

In the long run, rent control has other unintended effects. The long run in this case means enough time for the number of rental units to grow through construction of new units or shrink through abandonment of old ones (or their conversion to condominiums). Other things being equal, the higher the rent, the greater the rate of construction; the lower the rent, the greater the rate of abandonment or conversion. Those effects produce the positively sloped long-run supply curve in Part (b) of Figure 2–10.

If landlords enforce rent controls in such a way that there are no disguised charges, the number of rental units shrinks, and the market moves from E_1 to E_2. At E_2, the unintended effects that appeared in the short run become more pronounced. The intensity of housing discrimination increases relative to the short-run case because the difference between the number of units available and the number sought by renters increases. That difference shows up as a horizontal gap between the supply and demand curves at the ceiling price. In the short run, there is a shortage of fifty thousand units; in the long run, the shortage increases to seventy-five thousand units.

Advocates of rent controls often defend them as beneficial to the poor; but when all of the unintended effects of rent control are taken into account, one may question whether that is really true. In cases in which disguised rent increases are possible, the true cost of rental housing does not really fall. Further, it is hard to believe that the tendency of landlords to discriminate against minority group members, single-parent

BVT Lab

Visit www.BVTLab.com to explore the student resources available for this chapter.

families, and tenants with irregular work histories will benefit the poor. The most likely beneficiaries of rent control are stable middle-class families who work at the same jobs and live in the same apartments for long periods.

Why does rent control persist as a policy, given its many unintended consequences? Some economists explain the popularity of rent control in terms of the political power of the middle-class tenants, who are most likely to benefit from rent controls and who see "helping the poor" as nothing more than a convenient cover for their own self-interest. Some explain the popularity in terms of the short time horizon of government officials: The adverse effect on tenants of ending rent control would appear very quickly, whereas such benefits as increased construction of new apartments would materialize only long after the next election. Others attribute the popularity of rent control to the simple fact that many voters do not give much thought to the policy's unintended consequences.

Whatever the reason, it appears that rent control is very gradually weakening its hold. In New York and elsewhere, strict rent ceilings are gradually giving way to more flexible forms of "rent stabilization" that limit increases for sitting tenants but allow larger increases for new tenants and make it easier to pass cost increases through to higher rents.

2.4c Equilibrium as Spontaneous Order

The way that markets adjust to change is an example of economic coordination through spontaneous order. Consider, again, the market for cocoa. Adjustments to changes in income, consumer tastes, political events, and growing conditions involve decisions made by thousands of farmers, wholesalers, and retailers, as well as millions of consumers. Somehow their action must all be coordinated. But how?

A market economy needs no central planning agency or regulatory bureaucracy. The required changes in the use of scarce resources take place in response to information and incentives transmitted by changing market prices. As prices rise, farmers plant new cocoa trees where possible. At the same time researchers redouble their efforts to breed disease-resistant trees. Meanwhile candy makers in Europe and the United States employ new marketing strategies—like introducing vintage, estate-grown chocolates in an attempt to maintain the product's appeal as its price rises.

2.5 Some Closing Thoughts

This chapter has covered the basics of the supply and demand model and described a few of its applications. There are many more applications in both macro- and microeconomics. In macroeconomics, supply and demand apply to financial markets, labor markets, and the problem of determining the rate of inflation and real output for the economy as a whole. In microeconomics, the model applies to product markets, markets for labor and natural resources, and policy issues ranging from pollution to farm policy to international trade. As the great economist Alfred Marshall once put it, nearly all of the major problems of economics have a "kernel" that reflects the workings of supply and demand (see *Who Said It? Who Did It? 2.1*).

When we turn from the general outline presented in this chapter to some of the finer details, we will see that the supply and demand model fits some markets more closely than others. The fit is best for markets in which there are many buyers and many sellers, the goods offered by one seller are much like those sold by others, and all buyers and sellers have good information on market conditions. Markets for farm commodities, such as wheat and corn, and some financial markets, such as the New York Stock Exchange, meet these standards reasonably well.

However, not all markets display all of these features. Chocolate is an example. Cocoa, the basic commodity, fits the supply and demand model closely. Markets for high-end chocolate confections do not. In those markets, the products of different producers are not alike, and just a few specialist firms dominate some segments of the market. Even in markets like those, however, the notions of supply and demand provide a useful framework to which we can add refinements and extensions.

Who Said It? Who Did It? 2.1

Alfred Marshall on Supply and Demand

(Wikimedia Commons)

Alfred Marshall, who many think was the greatest economist of his day, was born in London in 1842. His father was a Bank of England cashier who hoped the boy would enter the ministry. Young Marshall had other ideas, however. He turned down a theological scholarship at Oxford to study mathematics, receiving his MA from Cambridge in 1865.

While at Cambridge, Marshall joined a philosophical discussion group. There he became interested in promoting the broad development of the human mind. He was soon told that harsh economic realities would prevent the realization of his ideas. Britain's economic potential as a country could, supposedly, never allow the masses enough leisure for education. This disillusioning episode appears to have triggered Marshall's fascination with economics.

At the time, the classical school founded by Adam Smith and David Ricardo dominated British economics. Marshall had great respect for the classical writers. At first he saw his own work as simply applying his mathematical training to refine the classical system. Before long, however, he was breaking new ground and developing a system of his own. By 1890, when he brought out his famous *Principles of Economics*, he had laid the foundation of what we now call the neoclassical school.

In an attempt to explain the essence of his approach, Marshall included the following passage in the second edition of his *Principles*:

> In spite of a great variety in detail, nearly all the chief problems of economics agree in that they have a kernel of the same kind. This kernel is an inquiry as to the balancing of two opposed classes of motives, the one consisting of desires to acquire certain new goods, and thus satisfy wants; while the other consists of desires to avoid certain efforts or retain certain immediate enjoyment … in other words, it is an inquiry into the balancing of the forces of demand and supply.

Marshall's influence on economics—at least in the English-speaking world—was enormous. His *Principles* was the leading economics text for several decades, and modern students can still learn much from it. As a professor at Cambridge, Marshall taught a great many of the next generation's leading economists. Today his neoclassical school continues to dominate the profession. Many have challenged it, but it lives on.

SUMMARY

1. How does the price of a good or service affect the quantity that buyers demand?

The term *demand* means the willingness and ability of buyers to purchase goods and services. According to the *law of demand*, there is an inverse relationship between the price of a good and the quantity demanded. The *quantity demanded* is the amount buyers will purchase at a given price. We can represent the law of demand with a negatively sloped *demand curve*. A movement along the demand curve shows a change in the quantity demanded.

2. How do other market conditions affect demand?

A change in any of the variables covered by the "other things being equal" clause of the law of demand causes a shift in the demand curve, known as a *change in demand*. Examples include changes in the prices of goods that are *substitutes or complements* of the good in question, as well as changes in consumer incomes, expectations, and tastes.

3. How does the price of a good affect the quantity supplied by sellers?

The term *supply* means sellers' willingness and ability to offer products for sale in a market. In most markets, an increase in the price of a good will increase the quantity of the good that sellers are willing to supply. This relationship can be expressed by a positively sloped *supply curve*. The higher price gives producers an incentive to supply more, but rising opportunity costs set a limit on the amount they will supply at any given price.

4. How do changes in other market conditions affect supply?

A change in any of the items covered by the "other things being equal" clause of the supply curve will shift the curve. Examples include changes in technology, changes in the prices of inputs, changes in the prices of other goods that producers could make with the same resources, and changes in expectations.

5. How do supply and demand interact to determine the market price of a good or service?

In a market with a positively sloped supply curve and a negatively sloped demand curve, there is only one price at which the quantity of a good that sellers plan to supply will exactly match the quantity that buyers plan to purchase. We call that the *equilibrium* price. At any higher price, there will be a surplus; and at any lower price, there will be a shortage.

6. Why do market prices and quantities change in response to changes in market conditions?

A change in any market condition that shifts the supply or demand curve will change the equilibrium price and quantity in a market. For example, for a normal good, the demand curve will shift to the right if consumer incomes increase. That causes a shortage at the old price, and the price begins to rise. As the price rises, suppliers move up along the supply curve to a new equilibrium. Instead, an improvement in technology would shift the supply curve to the right. In that case there is a surplus at the old price, and the price will fall. As the price decreases, buyers will move down along their demand curve to a new equilibrium. No shift in the demand curve is required.

7. What are the unintended consequences of price floors and price ceilings?

Price floors, like those long imposed on milk and other farm products, are intended to help producers, but they lead to persistent surpluses. To prevent prices from falling, the government must buy surplus output and either store it or give it away. Price floors, like those on rent-controlled apartments, are intended to help low-income tenants, but they lead to persistent shortages. In the long run, construction slows and abandonments increase, so the shortages become more severe over time. Price ceilings and floors can still be found for some goods and services, but their unintended consequences have led many of them to be phased out over time.

KEY TERMS

Problems and Topics for Discussion

1. **A shifting demand curve** A vending machine company has studied the demand for soft drinks sold from machines. On a 70° day consumers in the firm's territory will buy about 2,000 cans at a price of $0.75. For each $0.05 rise in price, the quantity sold falls by 200 cans per day; for each 5° rise in temperature, the quantity sold rises by 150 cans per day. The same relationships hold for decreases in price or temperature. Using this information, draw a set of curves showing the demand for soft drinks on days when the temperature is 60°, 70°, and 85°. Then draw a separate diagram with temperature on the vertical axis and quantity on the horizontal axis. Draw a line representing the relationship between temperature and quantity when the price is $0.75. Next, draw additional temperature-quantity lines for prices of $0.50 and $1.00. Do the two diagrams give the same information? Discuss. (Note: If you have any trouble with this exercise, review the appendix to Chapter 1, "Working with Graphs," especially the section entitled "Packing Three Variables into Two Dimensions.")

2. **Demand and the price of motor fuel** From 2007 to 2008, the price of gasoline in the United States rose from $2.76 per gallon to $3.20 per gallon. The quantity used decreased from 3,389 million barrels to 3,290 million barrels. In 2009, the price fell to $2.30 per gallon, yet the quantity used continued to decline, to 3,283 million barrels. After-tax personal income increased from 2007 to 2008, but it fell from 2008 to 2009.

   Which one or more of the following hypotheses do you think best explain(s) the pattern of gasoline sales? Illustrate your chosen hypothesis with an appropriate diagram.

   a. In 2008, the demand curve for gasoline had the usual negative slope. However, in 2009, the demand curve shifted to a positively sloped position.

   b. The demand curve had a negative slope at all times, but because gasoline is a normal good, the demand curve shifted to the right in 2008 and then to the left in 2009.

3. **Shortages, price controls, and queues** During the late 1980s and early 1990s, economic reforms initiated by Soviet president Mikhail Gorbachev began to raise consumer incomes; however, the Soviet government continued to impose price ceilings on basic goods like food, clothing, and household goods. As higher income led to increased demand, severe shortages of many goods and long lines at all kinds of stores became common. Finally, in January 1992, a new Russian government under president Boris Yeltsin removed retail price controls on most goods. Within a month, prices more than doubled on average, and lines disappeared. Analyze these events using the supply and demand model. First draw a supply and demand diagram for some normal good such as butter. Show the market in equilibrium at a price of 1 ruble per kilo before the beginning of the Gorbachev reforms. Draw a horizontal line at that level to represent the price ceiling; no butter can be sold for more than 1 ruble per kilo. Next show the effect of rising income. Does it shift the supply curve? Does it shift the demand curve? What is the shortage or surplus at the controlled price? After the price control ends, assuming no further shift in the supply and demand curve, what happens to the price? What happens to the shortage or surplus?

Problems and Topics for Discussion

4. **Flexible pricing for rides** In most cities taxi fares stay the same every day and in every kind of weather. In contrast, ride services like Uber change prices more frequently. On a recent Halloween, some riders were shocked when they were charged far more than usual for a late evening ride from Uber. Do you think higher prices for rides on Halloween make sense from the point of view of supply and demand? Do you think it is ethical to charge a much higher price during a high-demand period like the evening of Halloween? (Uber says it always gives riders an estimate of the fare before they agree to the service.) Discuss in terms of efficiency and fairness.

5. **The market for olive oil** The chapter began by using olive oil as an example of a good whose price varies greatly from year to year. Using supply and demand diagrams, explain how each of the following would affect the market:

   a. A severe drought hits Spain, the world's largest olive oil producer. Would the supply curve shift? What about the demand curve? What will happen to the price?

   b. Medical research proves that the Mediterranean diet, which includes abundant use of olive oil, is not just a fad but is really good for you. In response, millions of consumers start following the diet. Would the supply curve shift? What about the demand curve? What will happen to the price?

CASE *for* DISCUSSION

Will CNG Power Your Next Car?

There has been a lot of talk in the United States about the automotive fuel of the future. Most of it has centered on ethanol, electricity, and, to some extent, hydrogen. Yet the real fuel of the future may turn out to be compressed natural gas, or CNG.

CNG as an automotive fuel is not new technology. Thousands of buses and delivery vehicles use it every day in the United States. So do millions of passenger cars in other countries. Now market forces favor CNG as an automotive fuel in the United States. As recently as 2005, natural gas actually cost more than gasoline on an energy-equivalent basis. By 2012, it cost only a quarter as much—a record gap between the two fuels.

What is behind the radical change in relative price? On the supply side, the main change is new technologies that allow greater production of nonconventional gas from shales, coal beds, and other sources. On the demand side, the change arises from greater environmental awareness on the part of consumers, regulations that encourage alternative fuels, and, yes, the rising price of oil.

So what is holding back widespread use of CNG, an off-the-shelf technology already in wide use elsewhere, for cars here in the United States? The main factor seems to be what economists call a *network problem*—in everyday terms, a chicken-and-egg issue. There are not enough filling stations that dispense natural gas. With the right kind of pump, filling you car's tank with CNG is just as quick and easy as using gasoline; however, it is not worth it for gas stations to install the pumps until there are lots of CNG-powered cars on the road. A few CNG cars, including a CNG-powered Honda, are already on the market, but demand will be limited until there are more filling stations.

However, the situation may be changing. One thing that helps is the availability of dual-fuel cars that will run on natural gas if it is available, but can switch to gasoline when it is not. Another is the increasing popularity of natural gas among long-haul truck drivers. Truck stops have found it worthwhile to invest in natural gas pumps even if neighborhood filling stations have not yet done so. A CNG-powered eighteen-wheeler can now make it coast to coast by following a chain of gas-dispensing truck stops. That will hasten the day when passenger cars will be able to do the same.

Sources: Ed Dolan's Econ Blog (http://dolanecon.blogspot.com), "Technology, Environment, and the Future of Natural Gas," Feb. 27, 2010, "Move Over Ethanol: Market Forces Favor CNG," March 16, 2011, and "What Is Holding Back Natural Gas as the Fuel of the Future?" Jan. 7, 2013. Used by permission of author.

Questions

1. Beginning from a position of equilibrium, use supply and demand curves to show how new technologies that reduce the cost of producing gas from unconventional deposits affect the market. Does the supply curve shift? The demand curve? Both? Explain.
2. Starting from the end point of your answer to Question 1, show the effects of increased consumer preference for alternative fuels. Does the supply curve shift? The demand curve? Both? Explain.
3. Environmentalists are concerned that producing natural gas by fracking may damage the environment. How would stricter regulations on fracking affect the market for natural gas? Would the supply curve shift? The demand curve? Both? Explain.

From Ed Dolan's Econ Blog

Ed Dolan's econ blog offers a wide selection of case studies in slideshow format. Each discusses recent events in a real-world market (chocolate, olive oil, CNG, and more) and shows how supply and demand curves can explain their effects. A list of available slideshows can be found at http://bvtlab.com/b998U, or scan the QR code.

CASE STUDIES

Index of Slideshows

Endnotes

1. Before continuing, you may want to review the Chapter 1 appendix, "Working with Graphs," especially the section entitled "Packing Three Variables into Two Dimensions."
2. The "plans" referred to need not be formal, or thought out in detail, and are subject to change. A consumer might, for example, make out a shopping list for the supermarket based on the usual prices for various foods, but then revise it to take into account unexpected price increases or sales on certain items. On specific occasions, consumer decisions may even be completely impulsive, with little basis in rational calculation. The model of supply and demand does not require people to base every decision on precise analysis; only that consumer intentions, on the average, are influenced by prices and other economic considerations.
3. Why might buyers and sellers enter the market expecting a price other than the one that permits equilibrium? It may be, for example, that market conditions have caused the supply or demand curve to shift unexpectedly, so that a price that formerly permitted equilibrium no longer does so; it may be that buyers or sellers expect conditions to change, but they do not change after all; or it may be that government policy has established a legal maximum or minimum price that differs from the equilibrium price. Later sections of the chapter will explore some of these possibilities.