CHAPTER 3: INTRODUCTION TO SUPPLY & DEMAND

Learning Objectives

- Demand, Supply, and Equilibrium in Markets for Goods and Services
- Shifts in Demand and Supply for Goods and Services
- Changes in Equilibrium Price and Quantity: The Four-Step Process
- Price Ceilings and Price Floors

Bring It Home

Why Can We Not Get Enough of Organic?

Organic food is increasingly popular, not just in the United States, but worldwide. At one time, consumers had to go to specialty stores or farmers' markets to find organic produce. Now it is available in most grocery stores. In short, organic is part of the mainstream.

Ever wonder why organic food costs more than conventional food? Why, say, does an organic Fuji apple cost $1.99 a pound, while its conventional counterpart costs $1.49 a pound? The same price relationship is true for just about every organic product on the market. If many organic foods are locally grown, would they not take less time to get to market and therefore be cheaper? What are the forces that keep those prices from coming down? Turns out those forces have quite a bit to do with this chapter's topic: demand and supply.

An auction bidder pays thousands of dollars for a dress Whitney Houston wore. A collector spends a small fortune for a few drawings by John Lennon. People usually react to purchases like these in two ways: their jaw

drops because they think these are high prices to pay for such goods or they think these are rare, desirable items and the amount paid seems right.

Link It Up

Weirdest Celebrity Items Sold At Auction: Britney Spears' Gum, Brad Pitt's Breath And More [New Tab] (https://www.huffpost.com/entry/weirdest-celebrity-items-sold-at-auction_n_1791850) lists the bizarre items that have been purchased for their ties to celebrities. These examples represent an interesting facet of demand and supply.

When economists talk about prices, they are less interested in making judgments than in gaining a practical understanding of what determines prices and why prices change. Consider a price most of us contend with weekly: that of a gallon of gas. Why was the average price of gasoline in the United States $3.71 per gallon in June 2014? Why did the price for gasoline fall sharply to $1.96 per gallon by January 2016? To explain these price movements, economists focus on the determinants of what gasoline buyers are willing to pay and what gasoline sellers are willing to accept.

As it turns out, the price of gasoline in June of any given year is nearly always higher than the price in January of that same year. Over recent decades, gasoline prices in midsummer have averaged about 10 cents per gallon more than their midwinter low. The likely reason is that people drive more in the summer, and are also willing to pay more for gas, but that does not explain how steeply gas prices fell. Other factors were at work during those 18 months, such as increases in supply and decreases in the demand for crude oil.

This chapter introduces the economic model of demand and supply—one of the most powerful models in all of economics. The discussion here begins by examining how demand and supply determine the price and the quantity sold in markets for goods and services, and how changes in demand and supply lead to changes in prices and quantities.

Attribution

3.1 - DEMAND

Learning Objectives

- Define the quantity demanded of a good or service and illustrate it using a demand schedule and a demand curve.
- Distinguish between the following pairs of concepts: demand and quantity demanded, demand schedule and demand curve, movement along and shift in a demand curve.
- Identify demand shifters and determine whether a change in a demand shifter causes the demand curve to shift to the right or to the left.

How many pizzas will people eat this year? How many doctor visits will people make? How many houses will people buy?

Each good or service has its own special characteristics that determine the quantity people are willing and able to consume. One is the price of the good or service itself. Other independent variables that are important determinants of demand include consumer preferences, prices of related goods and services, income, demographic characteristics such as population size, and buyer expectations. The number of pizzas people will purchase, for example, depends very much on whether they like pizza. It also depends on the prices for alternatives such as hamburgers or spaghetti. The number of doctor visits is likely to vary with income—people with higher incomes are likely to see a doctor more often than people with lower incomes. The demands for pizza, for doctor visits, and for housing are certainly affected by the age distribution of the population and its size.

While different variables play different roles in influencing the demands for different goods and services, economists pay special attention to one: the price of the good or service. Given the values of all the other variables that affect demand, a higher price tends to reduce the quantity people demand, and a lower price tends to increase it. A medium pizza typically sells for $5 to $10. Suppose the price were $30. Chances are, you

would buy fewer pizzas at that price than you do now. Suppose pizzas typically sold for $2 each. At that price, people would be likely to buy more pizzas than they do now.

We will discuss first how price affects the quantity demanded of a good or service and then how other variables affect demand.

Price and the Demand Curve

Because people will purchase different quantities of a good or service at different prices, economists must be careful when speaking of the "demand" for something. They have therefore developed some specific terms for expressing the general concept of demand.

The quantity demanded of a good or service is the quantity buyers are willing and able to buy at a particular price during a particular period, all other things unchanged. (As we learned, we can substitute the Latin phrase "ceteris paribus" for "all other things unchanged.") Suppose, for example, that 100,000 movie tickets are sold each month in a particular town at a price of $8 per ticket. That quantity—100,000—is the quantity of movie admissions demanded per month at a price of $8. If the price were $12, we would expect the quantity demanded to be less. If it were $4, we would expect the quantity demanded to be greater. The quantity demanded at each price would be different if other things that might affect it, such as the population of the town, were to change. That is why we add the qualifier that other things have not changed to the definition of quantity demanded.

A demand schedule is a table that shows the quantities of a good or service demanded at different prices during a particular period, all other things unchanged. To introduce the concept of a demand schedule, let us consider the demand for coffee in the United States. We will ignore differences among types of coffee beans and roasts, and speak simply of coffee. The table in Figure 3.1a. A Demand Schedule and a Demand Curve shows quantities of coffee that will be demanded each month at prices ranging from $9 to $4 per pound; the table is a demand schedule. We see that the higher the price, the lower the quantity demanded.

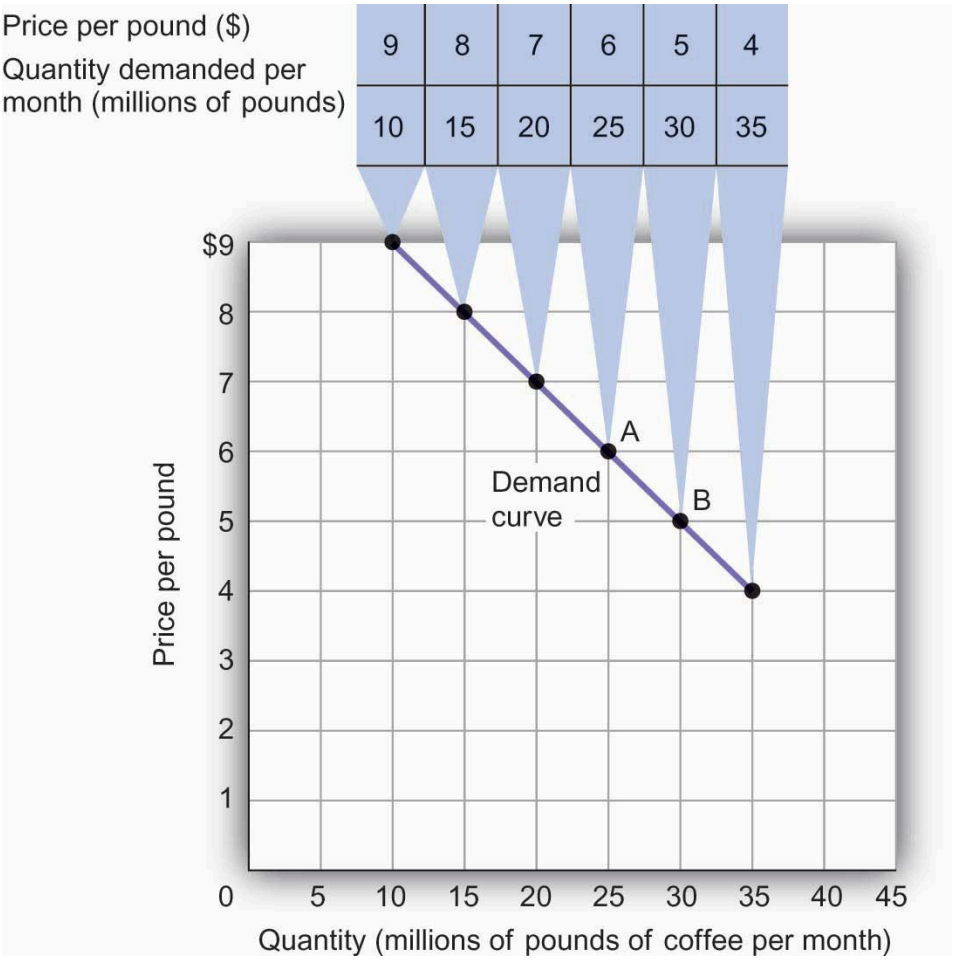

Figure 3.1a A Demand Schedule and a Demand Curve. The table is a demand schedule; it shows quantities of coffee demanded per month in the United States at particular prices, all other things unchanged. These data are then plotted on the demand curve. At point A on the curve, 25 million pounds of coffee per month are demanded at a price of $6 per pound. At point B, 30 million pounds of coffee per month are demanded at a price of $5 per pound. Figure by University of Minnesota, licensed under CC BY-NC-SA 4.0.

Figure 3.1a A Demand Schedule and a Demand Curve Text Version

The vertical axis Price Per Pound and the horizontal axis is Quantity (Millions of pounds of coffee per month). These data are then plotted on the demand curve. The demand curve slopes downward from left to right. Table 3.1a contains data for Figure 3.1. A Demand Schedule and a Demand Curve.

Table 3.1a. A Demand Schedule and a Demand Curve

Price Per Pound ($)	Quantity Demanded Per Month (Millions of Pounds)
9	10
8	15
7	20
6	25
5	30
4	35

The information given in a demand schedule can be presented with a demand curve, which is a graphical representation of a demand schedule. A demand curve thus shows the relationship between the price and quantity demanded of a good or service during a particular period, all other things unchanged. The demand curve in Figure 3.1a A Demand Schedule and a Demand Curve shows the prices and quantities of coffee demanded that are given in the demand schedule. At point A, for example, we see that 25 million pounds of coffee per month are demanded at a price of $6 per pound. By convention, economists graph price on the vertical axis and quantity on the horizontal axis.

Price alone does not determine the quantity of coffee or any other good that people buy. To isolate the effect of changes in price on the quantity of a good or service demanded, however, we show the quantity demanded at each price, assuming that those other variables remain unchanged. We do the same thing in drawing a graph of the relationship between any two variables; we assume that the values of other variables that may affect the variables shown in the graph (such as income or population) remain unchanged for the period under consideration.

A change in price, with no change in any of the other variables that affect demand, results in a movement *along* the demand curve. For example, if the price of coffee falls from $6 to $5 per pound, consumption rises from 25 million pounds to 30 million pounds per month. That is a movement from point A to point B along the demand curve in Figure 3.1a A Demand Schedule and a Demand Curve. A movement along a demand curve that results from a change in price is called a change in quantity demanded. Note that a change in quantity demanded is not a change or shift in the demand curve; it is a movement *along* the demand curve.

The negative slope of the demand curve in Figure 3.1a A Demand Schedule and a Demand Curve suggests a key behavioral relationship of economics. All other things unchanged, the law of demand holds that, for virtually all goods and services, a higher price leads to a reduction in quantity demanded and a lower price leads to an increase in quantity demanded.

The law of demand is called a law because the results of countless studies are consistent with it. Undoubtedly, you have observed one manifestation of the law. When a store finds itself with an overstock of some item, such as running shoes or tomatoes, and needs to sell these items quickly, what does it do? It typically has a sale, expecting that a lower price will increase the quantity demanded. In general, we expect the law of demand to hold. Given the values of other variables that influence demand, a higher price reduces the quantity demanded. A lower price increases the quantity demanded. Demand curves, in short, slope downward.

Changes in Demand

Of course, price alone does not determine the quantity of a good or service that people consume. Coffee consumption, for example, will be affected by such variables as income and population. Preferences also play a role. The story at the beginning of the chapter illustrates as much. Starbucks "turned people on" to coffee. We also expect other prices to affect coffee consumption. People often eat doughnuts or bagels with their coffee, so a reduction in the price of doughnuts or bagels might induce people to drink more coffee. An alternative to coffee is tea, so a reduction in the price of tea might result in the consumption of more tea and less coffee. Thus, a change in any one of the variables held constant in constructing a demand schedule will change the quantities demanded at each price. The result will be a *shift* in the entire demand curve rather than a movement along the demand curve. A *shift* in a demand curve is called a change in demand.

Suppose, for example, that something happens to increase the quantity of coffee demanded at each price. Several events could produce such a change: an increase in incomes, an increase in population, or an increase in the price of tea would each be likely to increase the quantity of coffee demanded at each price. Any such change produces a new demand schedule. Figure 3.1b An Increase in Demand shows such a change in the demand schedule for coffee. We see that the quantity of coffee demanded per month is greater at each price than before. We show that graphically as a shift in the demand curve. The original curve, labeled D_1, shifts to the right to D_2. At a price of $6 per pound, for example, the quantity demanded rises from 25 million pounds per month (point A) to 35 million pounds per month (point A′).

Price	Old quantity demanded	New quantity demanded
$9	10	20
8	15	25
7	20	30
6	25	35
5	30	40
4	35	45

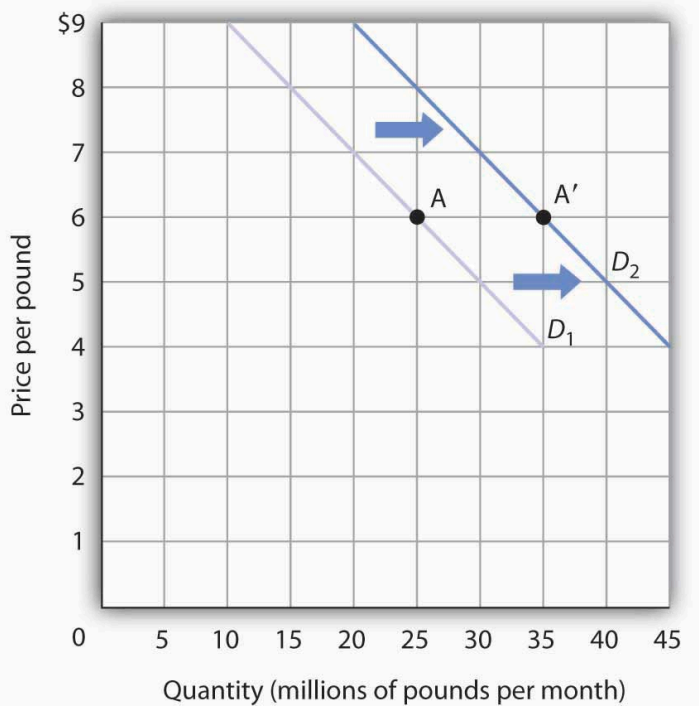

Figure 3.1b An Increase in Demand. Figure by University of Minnesota, licensed under CC BY-NC-SA 4.0.

Figure 3.1b An Increase in Demand Textual Version

Figure 3.1b graph: The vertical axis is Price per pound and the horizontal axis is the Quantity (millions of pounds per month). An increase in the quantity of a good or service demanded at each price is shown as an increase in demand. The original demand curve D1 shifts to the right to D2. Point A on D1 corresponds to a price of $6 per pound and a quantity demanded of 25 million pounds of coffee per month. On the new demand curve D2, the quantity demanded at this price rises to 35 million pounds of coffee per month (point A′). The demand curve is linear and trends downward left to right. Table 3.2 An contains data for Figure 3.2 An Increase in Demand.

Table 3.1b An Increase in Demand

Price (per pound)	Old quantity demanded (D_1)	New quantity demanded (D_2)
$9	10	20
$8	15	25
$7	20	30
$6	25 (Point A)	35 (Point A')
$5	30	40
$4	35	45

Just as demand can increase, it can decrease. In the case of coffee, demand might fall as a result of events such as a reduction in population, a reduction in the price of tea, or a change in preferences. For example, a definitive finding that the caffeine in coffee contributes to heart disease, which is currently being debated in the scientific community, could change preferences and reduce the demand for coffee.

A reduction in the demand for coffee is illustrated in Figure 3.1c A Reduction in Demand. The demand schedule shows that less coffee is demanded at each price than in Figure 3.1a A Demand Schedule and a Demand Curve. The result is a shift in demand from the original curve D_1 to D_3. The quantity of coffee demanded at a price of $6 per pound falls from 25 million pounds per month (point A) to 15 million pounds per month (point A″). Note, again, that a change in quantity demanded, ceteris paribus, refers to a movement *along* the demand curve, while a change in demand refers to a *shift* in the demand curve.

Price	Old quantity demanded	New quantity demanded
$9	10	0
8	15	5
7	20	10
6	25	15
5	30	20
4	35	25

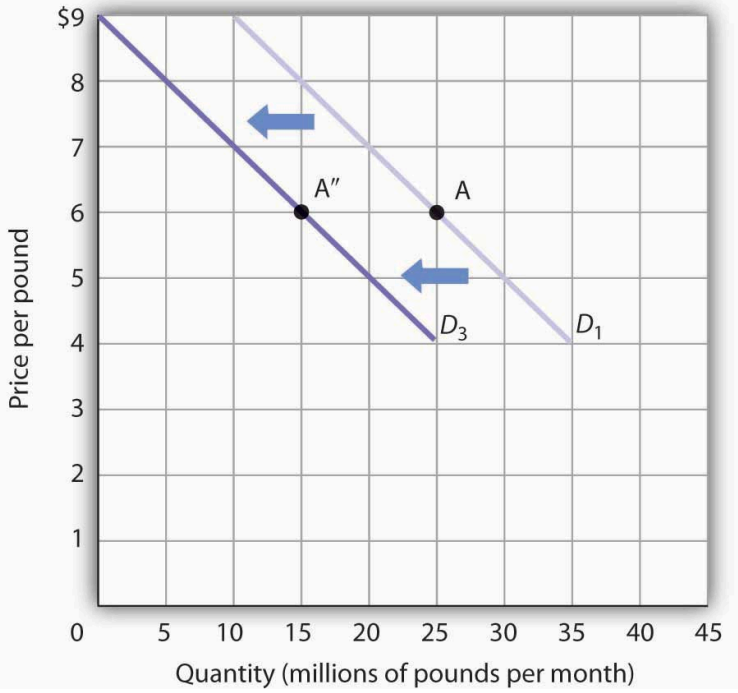

Figure 3.3 A Reduction in Demand Figure by University of Minnesota, licensed under CC BY-NC-SA 4.0.

Figure 3.1c A Reduction in Demand Textual Version

Figure 3.1c Graph: The vertical axis is Price per pound and the horizontal axis is the Quantity (millions of pounds per month). The demand curve slopes downward from left to right. The reduction in demand shifts the demand curve for coffee to the left, from the original demand curve (D_1) to new demand curve (D_3). The quantity demanded at a price of $6 per pound, for example, falls from 25 million pounds per month (point A) to 15 million pounds of coffee per month (point A″).

Table 3.1c A Reduction in Demand

Price (per pound)	Old quantity demanded (D_1)	New quantity demanded (D_3)
$9	10	0
$8	15	5
$7	20	10
$6	25 (Point A)	15 (Point A")
$5	30	20
$4	35	25

A reduction in the demand for coffee is illustrated in Figure 3.1c. A Reduction in Demand. The demand schedule shows that less coffee is demanded at each price than in Figure 3.1a. A Demand Schedule and a Demand Curve. The result is a shift in demand from the original curve D_1 to D_3. The quantity of coffee demanded at a price of $6 per pound falls from 25 million pounds per month (point A) to 15 million pounds per month (point A″). Note, again, that a change in quantity demanded, ceteris paribus, refers to a movement *along* the demand curve, while a change in demand refers to a *shift* in the demand curve.

A variable that can change the quantity of a good or service demanded at each price is called a demand shifter. When these other variables change, the all-other-things-unchanged conditions behind the original demand curve no longer hold. Although different goods and services will have different demand shifters, the demand shifters are likely to include:

1. consumer preferences
2. the prices of related goods and services
3. income
4. demographic characteristics
5. buyer expectations.

Next we look at each of these.

Preferences

Changes in preferences of buyers can have important consequences for demand. We have already seen how Starbucks supposedly increased the demand for coffee. Another example is reduced demand for cigarettes caused by concern about the effect of smoking on health. A change in preferences that makes one good or service more popular will shift the demand curve to the right. A change that makes it less popular will shift the demand curve to the left.

Prices of Related Goods and Services

Suppose the price of doughnuts were to fall. Many people who drink coffee enjoy dunking doughnuts in their coffee; the lower price of doughnuts might therefore increase the demand for coffee, shifting the demand curve for coffee to the right. A lower price for tea, however, would be likely to reduce coffee demand, shifting the demand curve for coffee to the left.

In general, if a reduction in the price of one good increases the demand for another, the two goods are called complements. If a reduction in the price of one good reduces the demand for another, the two goods are called substitutes. These definitions hold in reverse as well: two goods are complements if an increase in the price of one reduces the demand for the other, and they are substitutes if an increase in the price of one increases the demand for the other. Doughnuts and coffee are complements; tea and coffee are substitutes.

Complementary goods are goods used in conjunction with one another. Tennis rackets and tennis balls, eggs and bacon, and stationery and postage stamps are complementary goods. Substitute goods are goods used instead of one another. iPODs, for example, are likely to be substitutes for CD players. Breakfast cereal is a substitute for eggs. A file attachment to an e-mail is a substitute for both a fax machine and postage stamps.

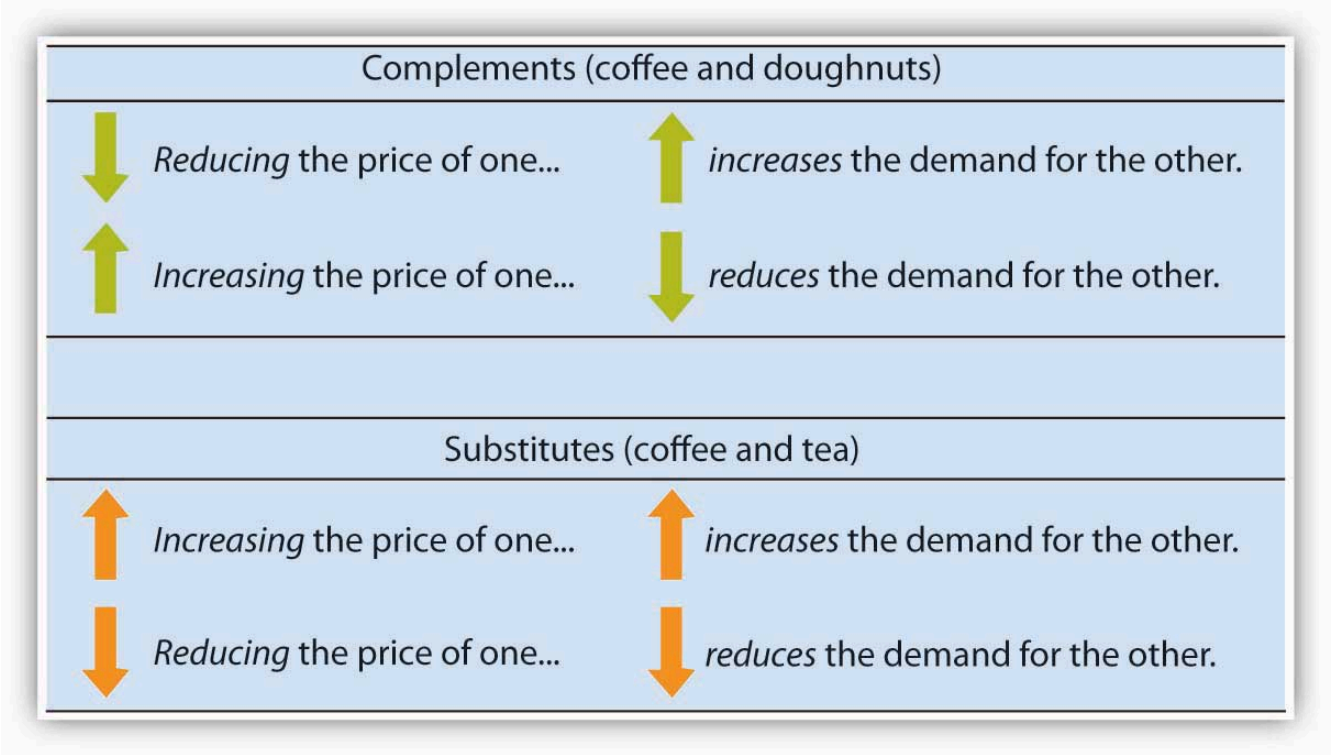

Figure 3.1d. Figure by University of Minnesota, licensed under CC BY-NC-SA 4.0.

Income

As incomes rise, people increase their consumption of many goods and services, and as incomes fall, their consumption of these goods and services falls. For example, an increase in income is likely to raise the demand for gasoline, ski trips, new cars, and jewelry. There are, however, goods and services for which consumption falls as income rises—and rises as income falls. As incomes rise, for example, people tend to consume more fresh fruit but less canned fruit.

A good for which demand increases when income increases is called a normal good. A good for which demand decreases when income increases is called an inferior good. An increase in income shifts the demand curve for fresh fruit (a normal good) to the right; it shifts the demand curve for canned fruit (an inferior good) to the left.

Demographic Characteristics

The number of buyers affects the total quantity of a good or service that will be bought; in general, the greater the population, the greater the demand. Other demographic characteristics can affect demand as well. As the share of the population over age 65 increases, the demand for medical services, ocean cruises, and motor homes increases. The birth rate in the United States fell sharply between 1955 and 1975 but has gradually increased since then. That increase has raised the demand for such things as infant supplies, elementary school teachers, soccer coaches, in-line skates, and college education. Demand can thus shift as a result of changes in both the number and characteristics of buyers.

Buyer Expectations

The consumption of goods that can be easily stored, or whose consumption can be postponed, is strongly affected by buyer expectations. The expectation of newer TV technologies, such as high-definition TV, could slow down sales of regular TVs. If people expect gasoline prices to rise tomorrow, they will fill up their tanks today to try to beat the price increase. The same will be true for goods such as automobiles and washing machines: an expectation of higher prices in the future will lead to more purchases today. If the price of a good is expected to fall, however, people are likely to reduce their purchases today and await tomorrow's lower prices. The expectation that computer prices will fall, for example, can reduce current demand.

Heads Up!

It is crucial to distinguish between a change in quantity demanded, which is a movement along the demand curve caused by a change in price, and a change in demand, which implies a shift of the demand curve itself. A change in demand is caused by a change in a demand shifter- a change in price causes a movement along the demand curve. An increase in demand is a shift of the demand curve to the right. A decrease in demand is a shift in the demand curve to the left. This drawing of a demand curve highlights the difference.

Key Takeaways

- The quantity demanded of a good or service is the quantity buyers are willing and able to buy at a particular price during a particular period, all other things unchanged.
- A demand schedule is a table that shows the quantities of a good or service demanded at different prices during a particular period, all other things unchanged.
- A demand curve shows graphically the quantities of a good or service demanded at different prices during a particular period, all other things unchanged.
- All other things unchanged, the law of demand holds that, for virtually all goods and services, a higher price induces a reduction in quantity demanded and a lower price induces an increase in quantity demanded.
- A change in the price of a good or service causes a change in the quantity demanded—a movement along the demand curve.
- A change in a demand shifter causes a change in demand, which is shown as a shift of the demand curve. Demand shifters include preferences, the prices of related goods and services, income, demographic characteristics, and buyer expectations.

- Two goods are substitutes if an increase in the price of one causes an increase in the demand for the other. Two goods are complements if an increase in the price of one causes a decrease in the demand for the other.
- A good is a normal good if an increase in income causes an increase in demand. A good is an inferior good if an increase in income causes a decrease in demand.

Try It!

All other things unchanged, what happens to the demand curve for DVD rentals if there is (a) an increase in the price of movie theater tickets, (b) a decrease in family income, or (c) an increase in the price of DVD rentals? In answering this and other "Try It!" problems in this chapter, draw and carefully label a set of axes. On the horizontal axis of your graph, show the quantity of DVD rentals. It is necessary to specify the time period to which your quantity pertains (e.g., "per period," "per week," or "per year"). On the vertical axis show the price per DVD rental. Since you do not have specific data on prices and quantities demanded, make a "free-hand" drawing of the curve or curves you are asked to examine. Focus on the general shape and position of the curve(s) before and after events occur. Draw new curve(s) to show what happens in each of the circumstances given. The curves could shift to the left or to the right, or stay where they are.

Check your answers

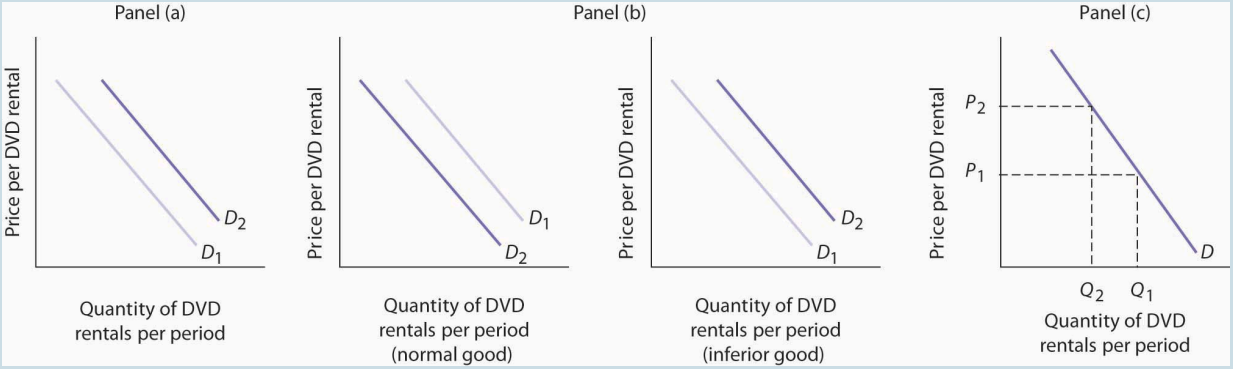

Figure 3.1f Figure by University of Minnesota, licensed under CC BY-NC-SA 4.0.

Figure 3.1f. Textual Version

Figure 3.1f depicts the changes in demand curve in 4 scenarios panel A, panel B, and panel C. The graphs all have Price per DVD rental on the vertical axis and the Quantity of DVD rentals per period on the horizontal axis. The demand curve is linear sloping downwards left to right and the original curve is denoted by D_1 and change in the demand curve by D_2 in Panels A and B.

Panel A illustrates that since going to the movies is a substitute for watching a DVD at home, an increase in the price of going to the movies should cause more people to switch from going to the movies to staying at home and renting DVDs. Thus, the demand curve for DVD rentals will shift to the right from D_1 to D_2 when the price of movie theater tickets increases.

Panel B contains 2 graphs: the first graph shows the shift in the demand curve for normal goods and the second graph shows the shift in the demand curve for the inferior goods. A decrease in family income will cause the demand curve to shift to the left if DVD rentals are a normal good but to the right if DVD rentals are an inferior good. The latter may be the case for some families, since staying at home and watching DVDs is a cheaper form of entertainment than taking the family to the movies. For most others, however, DVD rentals are probably a normal good.
Panel C depicts the increase in the price of DVD rentals. An increase in the price of DVD rentals does not shift the demand curve for DVD rentals at all; rather, an increase in price, say from P_1 to P_2, is a movement upward to the left along the demand curve. At a higher price people will rent fewer DVDs causing Q_1 to shift to the left to Q_2 ,ceteris paribus.

Case in Point: Solving Campus Parking Problems Without Adding

More Parking Spaces

Figure 3.1g. The Parking Lot (https://www.flickr.com/photos/autohistorian/16598201447/) by Alden Jewell, licensed under CC BY 2.0.

Unless you attend a "virtual" campus, chances are you have engaged in more than one conversation about how hard it is to find a place to park on campus. Indeed, according to Clark Kerr, a former president of the University of California system, a university is best understood as a group of people "held together by a common grievance over parking."

Clearly, the demand for campus parking spaces has grown substantially over the past few decades. In surveys conducted by Daniel Kenney, Ricardo Dumont, and Ginger Kenney, who work for the campus design company Sasaki and Associates, it was found that 7 out of 10 students own their own cars. They have interviewed "many students who confessed to driving from their dormitories to classes that were a five-minute walk away," and they argue that the deterioration of college environments is largely attributable to the increased use of cars on campus and that colleges could better service their missions by not adding more parking spaces.

Since few universities charge enough for parking to even cover the cost of building and maintaining parking lots, the rest is paid for by all students as part of tuition. Their research shows that "for every 1,000 parking spaces, the median institution loses almost $400,000 a year for surface parking, and more than $1,200,000 for structural parking." Fear of a backlash from students and

their parents, as well as from faculty and staff, seems to explain why campus administrators do not simply raise the price of parking on campus.

While Kenney and his colleagues do advocate raising parking fees, if not all at once then over time, they also suggest some subtler, and perhaps politically more palatable, measures—in particular, shifting the demand for parking spaces to the left by lowering the prices of substitutes.

Two examples they noted were at the University of Washington and the University of Colorado at Boulder. At the University of Washington, car poolers may park for free. This innovation has reduced purchases of single-occupancy parking permits by 32% over a decade. According to University of Washington assistant director of transportation services Peter Dewey, "Without vigorously managing our parking and providing commuter alternatives, the university would have been faced with adding approximately 3,600 parking spaces, at a cost of over $100 million...The university has created opportunities to make capital investments in buildings supporting education instead of structures for cars." At the University of Colorado, free public transit has increased use of buses and light rail from 300,000 to 2 million trips per year over the last decade. The increased use of mass transit has allowed the university to avoid constructing nearly 2,000 parking spaces, which has saved about $3.6 million annually.

Source: Kenney, D. R. (2004, March 26). How to solve campus parking problems without adding more parking. *The Chronicle of Higher Education, 50*(29), B22-B23.

Attribution

Media Attributions

3.2 - SUPPLY

Learning Objectives

- Define the quantity supplied of a good or service and illustrate it using a supply schedule and a supply curve.
- Distinguish between the following pairs of concepts: supply and quantity supplied, supply schedule and supply curve, movement along and shift in a supply curve.
- Identify supply shifters and determine whether a change in a supply shifter causes the supply curve to shift to the right or to the left.

What determines the quantity of a good or service sellers are willing to offer for sale? Price is one factor; ceteris paribus, a higher price is likely to induce sellers to offer a greater quantity of a good or service. Production cost is another determinant of supply. Variables that affect production cost include the prices of factors used to produce the good or service, returns from alternative activities, technology, the expectations of sellers, and natural events such as weather changes. Still another factor affecting the quantity of a good that will be offered for sale is the number of sellers—the greater the number of sellers of a particular good or service, the greater will be the quantity offered at any price per time period.

Price and the Supply Curve

The quantity supplied of a good or service is the quantity sellers are willing to sell at a particular price during a particular period, all other things unchanged. Ceteris paribus, the receipt of a higher price increases profits and induces sellers to increase the quantity they supply.

In general, when there are many sellers of a good, an increase in price results in an increase in quantity supplied, and this relationship is often referred to as the law of supply. We will see, though, through our exploration of microeconomics, that there are a number of exceptions to this relationship. There are cases in

which a higher price will not induce an increase in quantity supplied. Goods that cannot be produced, such as additional land on the corner of Park Avenue and 56th Street in Manhattan, are fixed in supply—a higher price cannot induce an increase in the quantity supplied. There are even cases, which we investigate in microeconomic analysis, in which a higher price induces a reduction in the quantity supplied.

Generally speaking, however, when there are many sellers of a good, an increase in price results in a greater quantity supplied. The relationship between price and quantity supplied is suggested in a supply schedule, a table that shows quantities supplied at different prices during a particular period, all other things unchanged. Figure 3.2a "A Supply Schedule and a Supply Curve" gives a supply schedule for the quantities of coffee that will be supplied per month at various prices, ceteris paribus. At a price of $4 per pound, for example, producers are willing to supply 15 million pounds of coffee per month. A higher price, say $6 per pound, induces sellers to supply a greater quantity—25 million pounds of coffee per month.

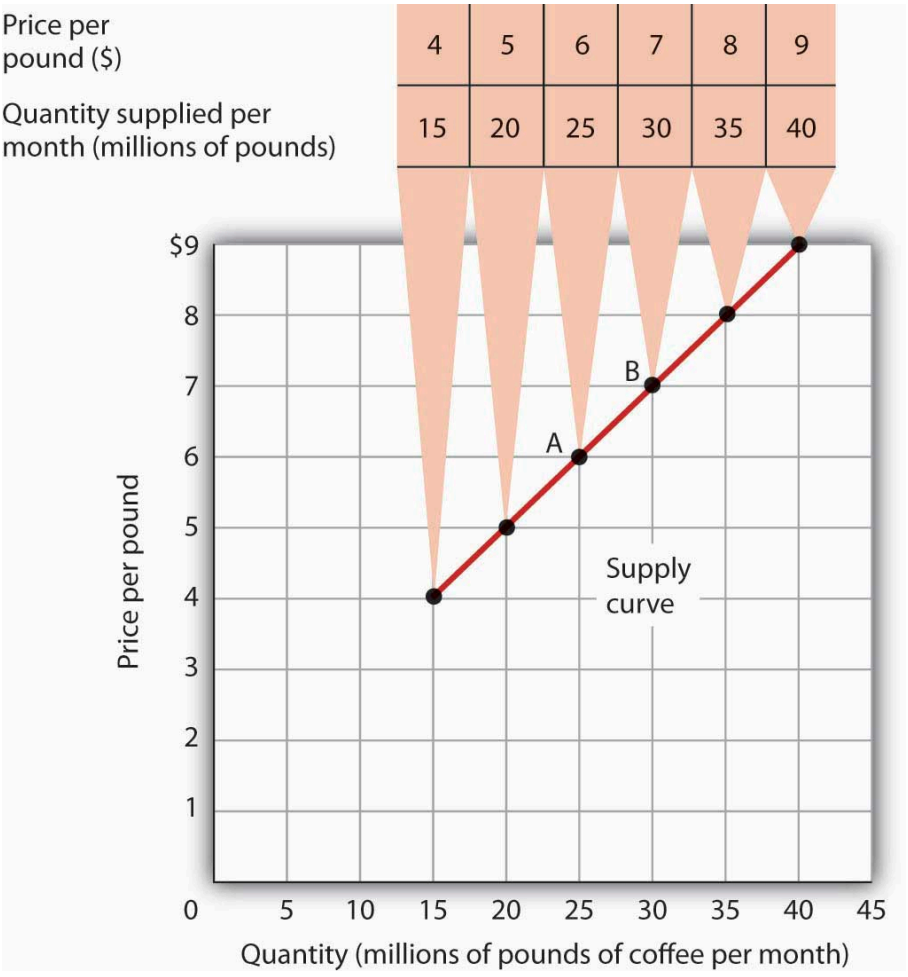

Figure 3.2a A Supply Schedule and a Supply Curve. Figure by University of Minnesota, licensed under CC BY-NC-SA 4.0.

Figure 3.2a A Supply Schedule and a Supply Curve Textual Version

Figure 3.2a: The vertical axis is price per pound ($)and the horizontal axis is quantity of coffee supplied per month. The supply curve slopes upward from left to right. The values given here suggest a positive relationship between price and quantity supplied. Table 3.2a A Supply Schedule and a Supply Curve contains data from Figure 3.2a.

Table 3.2a A Supply Schedule and a Supply Curve

Price per pound ($)	**Quantity supplied per month (millions per pounds of coffee per month)**
4	15
5	20
6	25
7	30
8	35
9	40

The supply schedule shows the quantity of coffee that will be supplied in the United States each month at particular prices, all other things unchanged. The same information is given graphically in the supply curve. The values given here suggest a positive relationship between price and quantity supplied. A supply curve is a graphical representation of a supply schedule. It shows the relationship between price and quantity supplied during a particular period, all other things unchanged. Because the relationship between price and quantity supplied is generally positive, supply curves are generally upward sloping. The supply curve for coffee in Figure 3.2a "A Supply Schedule and a Supply Curve" shows graphically the values given in the supply schedule.

A change in price causes a movement *along* the supply curve; such a movement is called a change in quantity supplied. As is the case with a change in quantity demanded, a change in quantity supplied does not shift the supply curve. By definition, it is a movement along the supply curve. For example, if the price rises from $6 per pound to $7 per pound, the quantity supplied rises from 25 million pounds per month to 30 million pounds per month. That's a movement from point A to point B along the supply curve in Figure 3.2a "A Supply Schedule and a Supply Curve".

Changes in Supply

When we draw a supply curve, we assume that other variables that affect the willingness of sellers to supply a good or service are unchanged. It follows that a change in any of those variables will cause a change in supply, which is a shift in the supply curve. A change that increases the quantity of a good or service supplied at each

price shifts the supply curve to the right. Suppose, for example, that the price of fertilizer falls. That will reduce the cost of producing coffee and thus increase the quantity of coffee producers will offer for sale at each price. The supply schedule in Figure 3.2b "An Increase in Supply" shows an increase in the quantity of coffee supplied at each price. Table 3.9 An Increase in Supply details data from Figure 3.9 An Increase in Supply.

If there is a change in supply that increases the quantity supplied at each price, as is the case in the supply schedule here, the supply curve shifts to the right from S_1 to S_2. At a price of $6 per pound, for example, the quantity supplied rises from the previous level of 25 million pounds per month on supply curve S_1 (point A) to 35 million pounds per month on supply curve S_2 (point A′).

Price	Old quantity supplied	New quantity supplied
$4	15	25
5	20	30
6	25	35
7	30	40
8	35	45
9	40	50

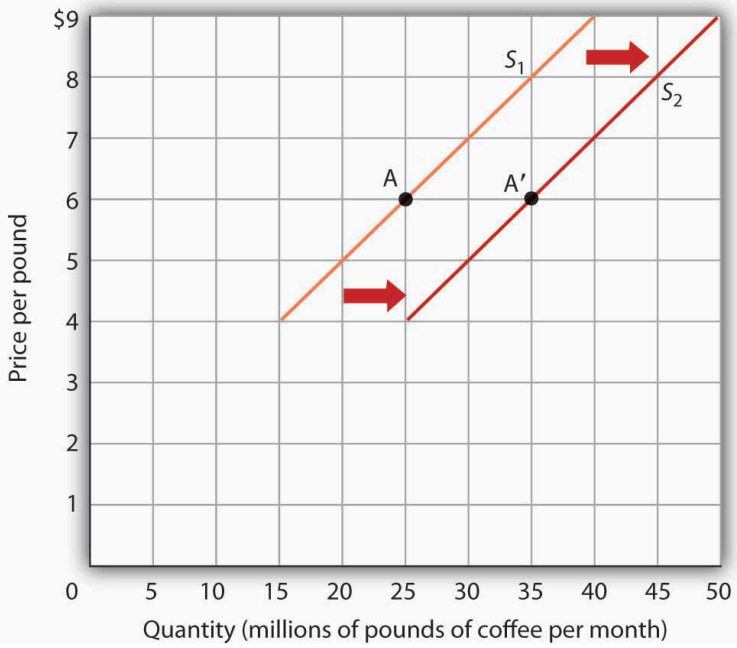

Figure 3.2b An Increase in Supply. Figure by University of Minnesota, licensed under CC BY-NC-SA 4.0.

Figure 3.2b An Increase in Supply Textual Version

The vertical axis is price per pound and the horizontal axis is quantity of coffee per month. The supply curve slopes upward left to right. There is a change in supply that increases the quantity supplied at each price causing the supply curve shifts to the right from original supply curve (S_1) to the new supply curve S_2. At a price of $6 per pound, for example, the quantity supplied rises from the previous level of 25 million pounds per month on supply curve S_1 (point A) to 35 million pounds per month on supply curve S_2 (point A′). Table 3.9 An Increase in Supply contains data from Figure 3.9.

Table 3.2b An Increase in Supply

Price ($)	Old quantity supplied (S_1)	New quantity supplied (S_2)
4	15	25
5	20	30
6	25	35
7	30	40
8	35	45
9	40	50

We show that increase graphically as a shift in the supply curve from S_1 to S_2. We see that the quantity supplied at each price increases by 10 million pounds of coffee per month. At point A on the original supply curve S_1, for example, 25 million pounds of coffee per month are supplied at a price of $6 per pound. After the increase in supply, 35 million pounds per month are supplied at the same price (point A′ on curve S_2).

An event that reduces the quantity supplied at each price shifts the supply curve to the left. An increase in production costs and excessive rain that reduces the yields from coffee plants are examples of events that might reduce supply. Figure 3.2c "A Reduction in Supply" shows a reduction in the supply of coffee. We see in the supply schedule that the quantity of coffee supplied falls by 10 million pounds of coffee per month at each price. The supply curve thus shifts from S_1 to S_3.

Price	Old quantity supplied	New quantity supplied
$4	15	5
5	20	10
6	25	15
7	30	20
8	35	25
9	40	30

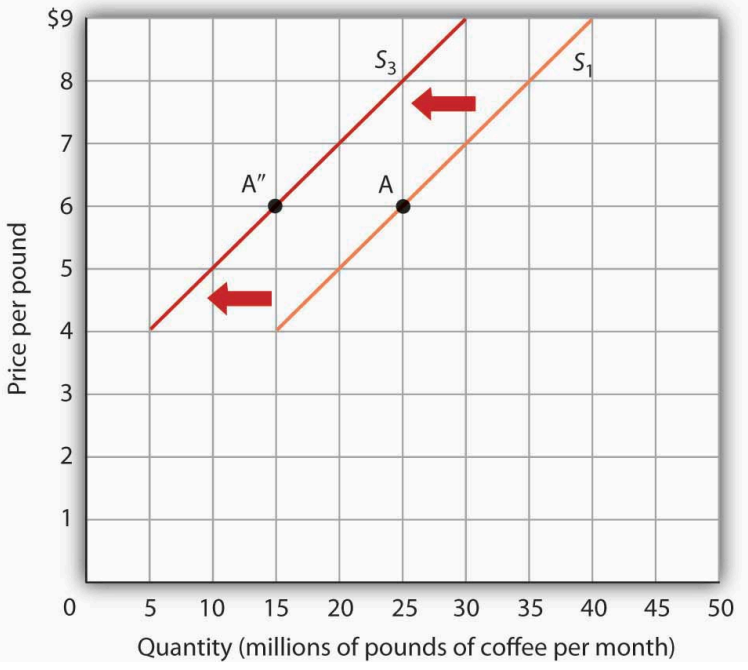

Figure 3.2c A Reduction in Supply. Figure by University of Minnesota, licensed under CC BY-NC-SA 4.0.

Figure 3.2c A Reduction in Supply Textual Version

Figure 3.2c Graph: The vertical axis is price per pound ($) and horizontal axis is quantity (millions of pounds of coffee per month). The supply curve slopes upwards left to right. A change in supply that reduces the quantity supplied at each price shifts the original supply curve (S1) to the left to the new supply curve (S3). At a price of $6 per pound, for example, the original quantity supplied was 25 million pounds of coffee per month (point A). With a new supply curve S3, the quantity supplied at that price falls to 15 million pounds of coffee per month (point A″).Table 3.2c A Reduction in Supply contains data from Figure 3.2c.

Table 3.2c A Reduction in Supply

Price ($)	Old quantity supplied	New quantity supplied
4	15	5
5	20	10
6	25	15
7	30	20
8	35	25
9	40	30

Figure 3.2c A Reduction in Supply. A change in supply that reduces the quantity supplied at each price shifts the supply curve to the left. At a price of $6 per pound, for example, the original quantity supplied was 25 million pounds of coffee per month (point A). With a new supply curve S_3, the quantity supplied at that price falls to 15 million pounds of coffee per month (point A″).

A variable that can change the quantity of a good or service supplied at each price is called a supply shifter. Supply shifters include:

1. prices of factors of production
2. returns from alternative activities
3. technology
4. seller expectations
5. natural events
6. the number of sellers.

When these other variables change, the all-other-things-unchanged conditions behind the original supply curve no longer hold. Let us look at each of the supply shifters.

Prices of Factors of Production

A change in the price of labour or some other factor of production will change the cost of producing any given quantity of the good or service. This change in the cost of production will change the quantity that suppliers are willing to offer at any price. An increase in factor prices should decrease the quantity suppliers will offer at any price, shifting the supply curve to the left. A reduction in factor prices increases the quantity suppliers will offer at any price, shifting the supply curve to the right.

Suppose coffee growers must pay a higher wage to the workers they hire to harvest coffee or must pay more for fertilizer. Such increases in production cost will cause them to produce a smaller quantity at each price, shifting the supply curve for coffee to the left. A reduction in any of these costs increases supply, shifting the supply curve to the right.

Returns from Alternative Activities

To produce one good or service means forgoing the production of another. The concept of opportunity cost in economics suggests that the value of the activity forgone is the opportunity cost of the activity chosen; this cost should affect supply. For example, one opportunity cost of producing eggs is not selling chickens. An increase in the price people are willing to pay for fresh chicken would make it more profitable to sell chickens and would thus increase the opportunity cost of producing eggs. It would shift the supply curve for eggs to the left, reflecting a decrease in supply.

Technology

A change in technology alters the combinations of inputs or the types of inputs required in the production process. An improvement in technology usually means that fewer and/or less costly inputs are needed. If the cost of production is lower, the profits available at a given price will increase, and producers will produce more. With more produced at every price, the supply curve will shift to the right, meaning an increase in supply.

Impressive technological changes have occurred in the computer industry in recent years. Computers are much smaller and are far more powerful than they were only a few years ago—and they are much cheaper to produce. The result has been a huge increase in the supply of computers, shifting the supply curve to the right.

While we usually think of technology as enhancing production, declines in production due to problems in technology are also possible. Outlawing the use of certain equipment without pollution-control devices has

increased the cost of production for many goods and services, thereby reducing profits available at any price and shifting these supply curves to the left.

Seller Expectations

All supply curves are based in part on seller expectations about future market conditions. Many decisions about production and selling are typically made long before a product is ready for sale. Those decisions necessarily depend on expectations. Changes in seller expectations can have important effects on price and quantity.

Consider, for example, the owners of oil deposits. Oil pumped out of the ground and used today will be unavailable in the future. If a change in the international political climate leads many owners to expect that oil prices will rise in the future, they may decide to leave their oil in the ground, planning to sell it later when the price is higher. Thus, there will be a decrease in supply; the supply curve for oil will shift to the left.

Natural Events

Storms, insect infestations, and drought affect agricultural production and thus the supply of agricultural goods. If something destroys a substantial part of an agricultural crop, the supply curve will shift to the left. The terrible cyclone that killed more than 50,000 people in Myanmar in 2008 also destroyed some of the country's prime rice growing land. That shifted the supply curve for rice to the left. If there is an unusually good harvest, the supply curve will shift to the right.

The Number of Sellers

The supply curve for an industry, such as coffee, includes all the sellers in the industry. A change in the number of sellers in an industry changes the quantity available at each price and thus changes supply. An increase in the number of sellers supplying a good or service shifts the supply curve to the right; a reduction in the number of sellers shifts the supply curve to the left.

The market for cellular phone service has been affected by an increase in the number of firms offering the service. Over the past decade, new cellular phone companies emerged, shifting the supply curve for cellular phone service to the right.

Heads Up!

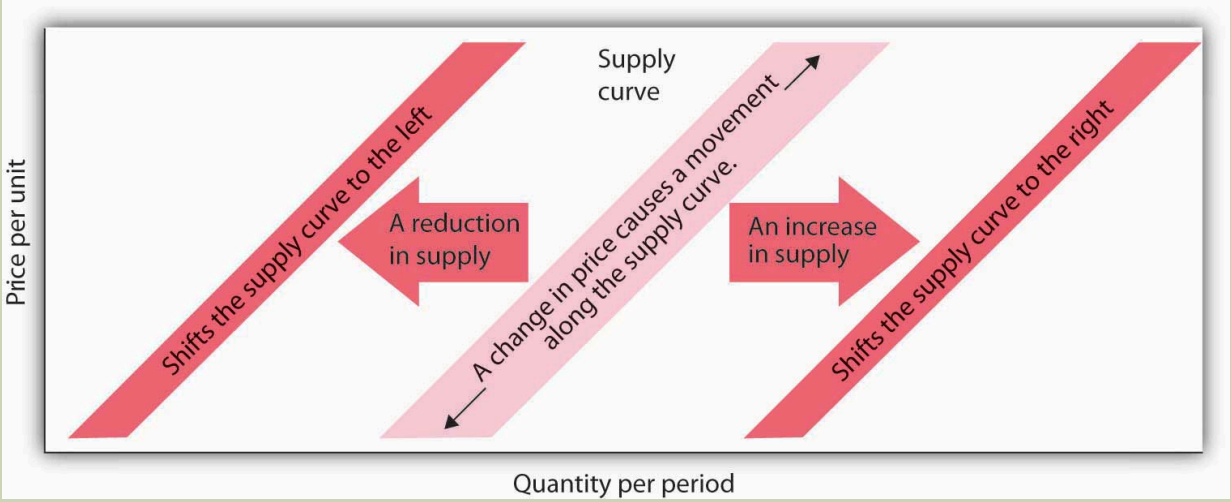

Figure 3.2d Figure by University of Minnesota, licensed under CC BY-NC-SA 4.0.

There are two special things to note about supply curves. First, it is important to distinguish carefully between changes in supply and changes in quantity supplied. A change in supply results from a change in a supply shifter and implies a shift of the supply curve to the right or left. A change in price produces a change in quantity supplied and induces a movement along the supply curve. A change in price does not shift the supply curve.

The second caution relates to the interpretation of increases and decreases in supply. Notice that in Figure 3.2b "An Increase in Supply" an increase in supply is shown as a shift of the supply curve to the right; the curve shifts in the direction of increasing quantity with respect to the horizontal axis. In Figure 3.2c "A Reduction in Supply" a reduction in supply is shown as a shift of the supply curve to the left; the curve shifts in the direction of decreasing quantity with respect to the horizontal axis.

Because the supply curve is upward sloping, a shift to the right produces a new curve that in a sense lies "below" the original curve. Students sometimes make the mistake of thinking of such a shift as a shift "down" and therefore as a reduction in supply. Similarly, it is easy to make the

mistake of showing an increase in supply with a new curve that lies "above" the original curve. But that is a reduction in supply!

To avoid such errors, focus on the fact that an increase in supply is an increase in the quantity supplied at each price and shifts the supply curve in the direction of increased quantity on the horizontal axis. Similarly, a reduction in supply is a reduction in the quantity supplied at each price and shifts the supply curve in the direction of a lower quantity on the horizontal axis.

Key Takeaways

- The quantity supplied of a good or service is the quantity sellers are willing to sell at a particular price during a particular period, all other things unchanged.
- A supply schedule shows the quantities supplied at different prices during a particular period, all other things unchanged. A supply curve shows this same information graphically.
- A change in the price of a good or service causes a change in the quantity supplied—a movement along the supply curve.
- A change in a supply shifter causes a change in supply, which is shown as a shift of the supply curve. Supply shifters include prices of factors of production, returns from alternative activities, technology, seller expectations, natural events, and the number of sellers.
- An increase in supply is shown as a shift to the right of a supply curve; a decrease in supply is shown as a shift to the left.

Try It!

If all other things are unchanged, what happens to the supply curve for DVD rentals if there is (a) an increase in wages paid to DVD rental store clerks, (b) an increase in the price of DVD rentals, or (c) an increase in the number of DVD rental stores? Draw a graph that shows what happens to the supply curve in each circumstance. The supply curve can shift to the left or to the right, or stay where it is. Remember to label the axes and curves, and remember to specify the time period (e.g., "DVDs rented per week").

Check your Answer

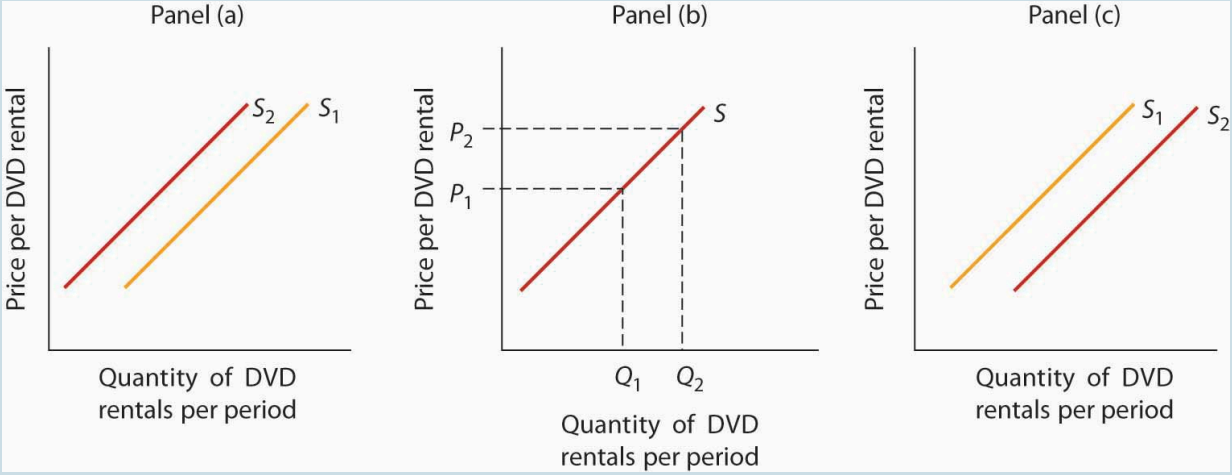

Figure 3.2e. Figure by University of Minnesota, licensed under CC BY-NC-SA 4.0

Figure 3.2e Textual Version

Figure 3.2e depicts the changes in supply curve in 4 scenarios: panel A, panel B, and panel C. The graphs all have Price per DVD rental on the vertical axis and the Quantity of DVD rentals per period on the horizontal axis. The supply curve is linear sloping upwards left to right and the original curve is denoted by S_1 and change in the Supply curve by S_2.

Panel A: DVD rental store clerks are a factor of production in the DVD rental market. An increase in their wages raises the cost of production, thereby causing the supply curve of DVD rentals to shift to the left. (*Caution*: It is possible that you thought of the wage increase as an increase in

income, a demand shifter, that would lead to an increase in demand, but this would be incorrect. The question refers only to wages of DVD rental store clerks. They may rent some DVD, but their impact on total demand would be negligible. Besides, we have no information on what has happened overall to incomes of people who rent DVDs. We do know, however, that the cost of a factor of production, which is a supply shifter, increased.)

Panel B: An increase in the price of DVD rentals does not shift the supply curve at all; rather, it corresponds to a movement upward to the right along the supply curve. At a higher price of P_2 instead of P_1, a greater quantity of DVD rentals, say Q_2 instead of Q_1, will be supplied.

Panel C: An increase in the number of stores renting DVDs will cause the supply curve to shift to the right.

Case in Point: The Monks of St. Benedict's Get Out of the Egg Business

Figure 3.2f St. Benedict's Abbey, Atchison, Kansas (https://www.flickr.com/photos/mariya_umama_wethemba_monastery/3668526533/in/photolist-6Aba8t-VGhZjf-s5YhPQ-rLMfkr-s5XDPh-rLLAJK-BHYq9y-cZL8ru-s3Pbvm-r9iRYD-28xWAdr-woGian-c4MNp-8vSZ1P-d6Avg1-Yudryw-j4cqq-5kGhgP-G6QckY-k9jW1o-p2f6RX-dWdG15-Xx4ija-YJDuvP-xFtJKP-LabUW2-2mswfqC-Lrd1vd-s66ACp-26KZAtt-2n5wjVv-2n8v8uK-2n5HYQj-2dtwmSV-R6S7or-2dLhjbY-2c9e4rz-e3dZBY-qHh7Qk-eRREoq-7KnRyF-n861NB-2iBN9R-dQAmE9-SJ7TTJ-d7HKFs-d7HEBf-4qA3kS-2gYsN1r-2n8v8Wg) by Randy Greve, licensed under CC BY 2.0.

It was cookies that lured the monks of St. Benedict's out of the egg business, and now private retreat sponsorship is luring them away from cookies.St. Benedict's is a Benedictine monastery, nestled on a ranch high in the Colorado Rockies, about 20 miles down the road from Aspen. The monastery's 15 monks operate the ranch to support themselves and to provide help for poor people in the area. They lease out about 3,500 acres of their land to cattle and sheep grazers, produce cookies, and sponsor private retreats. They used to produce eggs.

Attracted by potential profits and the peaceful nature of the work, the monks went into the egg business in 1967. They had 10,000 chickens producing their Monastery Eggs brand. For a while,

business was good. Very good. Then, in the late 1970s, the price of chicken feed started to rise rapidly.

"When we started in the business, we were paying $60 to $80 a ton for feed—delivered," recalls the monastery's abbot, Father Joseph Boyle. "By the late 1970s, our cost had more than doubled. We were paying $160 to $200 a ton. That really hurt, because feed represents a large part of the cost of producing eggs."

The monks adjusted to the blow. "When grain prices were lower, we'd pull a hen off for a few weeks to molt, then return her to laying. After grain prices went up, it was 12 months of laying and into the soup pot," Father Joseph says.

Grain prices continued to rise in the 1980s and increased the costs of production for all egg producers. It caused the supply of eggs to fall. Demand fell at the same time, as Americans worried about the cholesterol in eggs. Times got tougher in the egg business.

"We were still making money in the financial sense," Father Joseph says. "But we tried an experiment in 1985 producing cookies, and it was a success. We finally decided that devoting our time and energy to the cookies would pay off better than the egg business, so we quit the egg business in 1986."

The mail-order cookie business was good to the monks. They sold 200,000 ounces of Monastery Cookies in 1987.

By 1998, however, they had limited their production of cookies, selling only locally and to gift shops. Since 2000, they have switched to "providing private retreats for individuals and groups—about 40 people per month," according to Brother Charles.

The monks' calculation of their opportunity costs revealed that they would earn a higher return through sponsorship of private retreats than in either cookies or eggs. This projection has proved correct.

And there is another advantage as well.

"The chickens didn't stop laying eggs on Sunday," Father Joseph chuckles. "When we shifted to cookies we could take Sundays off. We weren't hemmed in the way we were with the chickens." The move to providing retreats is even better in this regard. Since guests provide their own meals, most of the monastery's effort goes into planning and scheduling, which frees up even more of their time for other worldly as well as spiritual pursuits.

Source: Personal interviews.

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3.3 - DEMAND AND SUPPLY

Start Up: Crazy for Coffee

Starbucks Coffee Company revolutionized the coffee-drinking habits of millions of people. Starbucks, whose bright green-and-white logo is almost as familiar as the golden arches of McDonald's, began in Seattle in 1971. Fifteen years later it had grown into a chain of four stores in the Seattle area. Then in 1987 Howard Schultz, a former Starbucks employee, who had become enamored with the culture of Italian coffee bars during a trip to Italy, bought the company from its founders for $3.8 million. In 2008, Americans were willingly paying $3 or more for a cappuccino or a latté, and Starbuck's had grown to become an international chain, with over 16,000 stores around the world.

The change in consumers' taste for coffee and the profits raked in by Starbucks lured other companies to get into the game. Retailers such as Seattle's Best Coffee and Gloria Jean's Coffees entered the US market, and today there are thousands of coffee bars, carts, drive-throughs, and kiosks in downtowns, malls, and airports all around the country. Even McDonald's began selling specialty coffees.

But over the last decade the price of coffee beans has been quite volatile. Just as consumers were growing accustomed to their cappuccinos and lattés, in 1997, the price of coffee beans shot up. Excessive rain and labour strikes in coffee-growing areas of South America had reduced the supply of coffee, leading to a rise in its price. In the early 2000s, Vietnam flooded the market with coffee, and the price of coffee beans plummeted. More recently, weather conditions in various coffee-growing countries reduced supply, and the price of coffee beans went back up.

Markets, the institutions that bring together buyers and sellers, are always responding to events, such as bad harvests and changing consumer tastes that affect the prices and quantities of particular goods. The demand for some goods increases, while the demand for others decreases. The supply of some goods rises, while the supply of others falls. As such events unfold, prices adjust to keep markets in balance. This chapter explains how the market forces of demand and supply interact to determine equilibrium prices and equilibrium quantities of goods and services. We will see how prices and quantities adjust to changes in demand and supply and how changes in prices serve as signals to buyers and sellers.

The model of demand and supply that we shall develop in this chapter is one of the most powerful tools in all of economic analysis. You will be using it throughout your study of economics. We will first look at the variables that influence demand. Then we will turn to supply, and finally we will put demand and supply

together to explore how the model of demand and supply operates. As we examine the model, bear in mind that demand is a representation of the behavior of buyers and that supply is a representation of the behavior of sellers. Buyers may be consumers purchasing groceries or producers purchasing iron ore to make steel. Sellers may be firms selling cars or households selling their labour services. We shall see that the ideas of demand and supply apply, whatever the identity of the buyers or sellers and whatever the good or service being exchanged in the market. In this chapter, we shall focus on buyers and sellers of goods and services.

Attribution

3.4 - DEMAND, SUPPLY, AND EQUILIBRIUM

Learning Objectives

- Use demand and supply to explain how equilibrium price and quantity are determined in a market.
- Understand the concepts of surpluses and shortages and the pressures on price they generate.
- Explain the impact of a change in demand or supply on equilibrium price and quantity.
- Explain how the circular flow model provides an overview of demand and supply in product and factor markets and how the model suggests ways in which these markets are linked.

In this section we combine the demand and supply curves we have just studied into a new model. The model of demand and supply uses demand and supply curves to explain the determination of price and quantity in a market.

The Determination of Price and Quantity

The logic of the model of demand and supply is simple. The demand curve shows the quantities of a particular good or service that buyers will be willing and able to purchase at each price during a specified period. The supply curve shows the quantities that sellers will offer for sale at each price during that same period. By putting the two curves together, we should be able to find a price at which the quantity buyers are willing and able to purchase equals the quantity sellers will offer for sale.

Figure 3.4a "The Determination of Equilibrium Price and Quantity" combines the demand and supply data introduced in Figure 3.1a "A Demand Schedule and a Demand Curve" and Figure 3.2a "A Supply Schedule and a Supply Curve" Notice that the two curves intersect at a price of $6 per pound—at this price the quantities demanded and supplied are equal. Buyers want to purchase, and sellers are willing to offer for sale,

25 million pounds of coffee per month. The market for coffee is in **equilibrium**. Unless the demand or supply curve shifts, there will be no tendency for price to change. The equilibrium price in any market is the price at which quantity demanded equals quantity supplied. The equilibrium price in the market for coffee is thus $6 per pound. The equilibrium quantity is the quantity demanded and supplied at the equilibrium price.

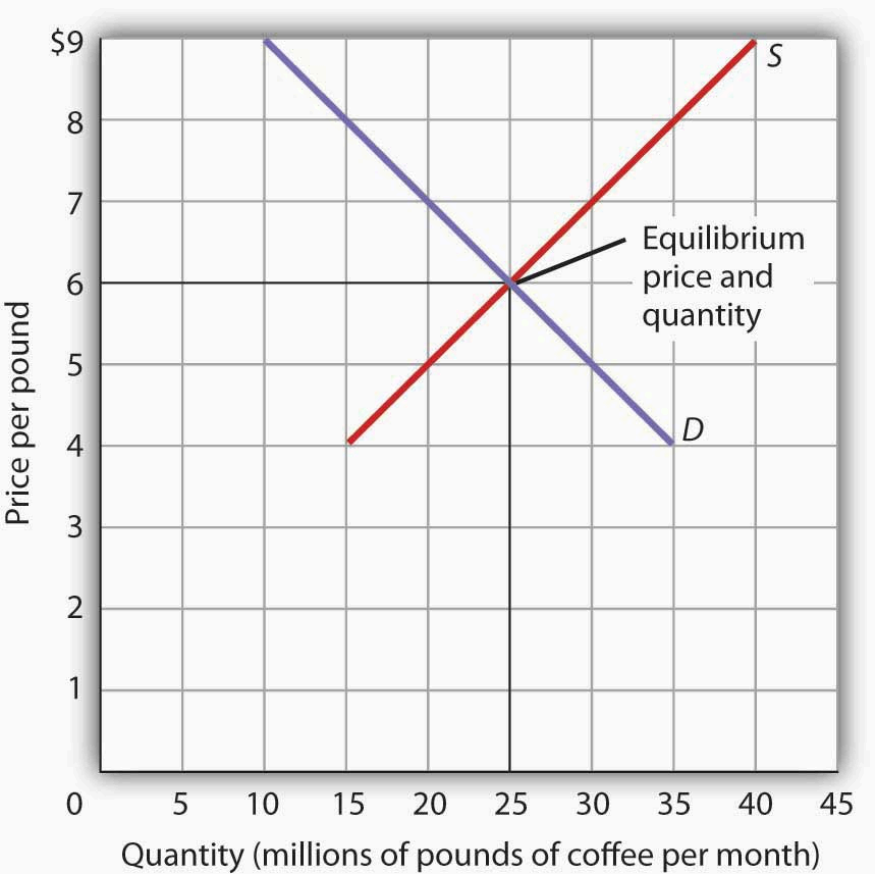


Figure 3.4a The Determination of Equilibrium Price and Quantity. Figure by University of Minnesota, licensed under CC BY-NC-SA 4.0.

Figure 3.4a The Determination of Equilibrium Price and Quantity Textual Version

Figure 3.4a has a vertical axis of Price per pound ($) and horizontal axis of Quantity (millions of pounds of coffee per month). The supply curve (S) slopes upward from left to right and the demand curve (D) slopes downward left to right. The equilibrium price and quantity occurs at the point where the supply curve (S) and the demand curve (D) intersect, 25 millions of pounds of coffee per month at $6 per pound. Table 3.4a contains data for the supply and demand curves for the Figure 3.4a.

Table 3.4a The Determination of Equilibrium Price and Quantity Data

Points	Supply Curve (S) (Quantity, Price)	Demand Curve (D) (Quantity, Price)
1	(15 million, $4)	(10 million, $9)
2	(20 million, $5)	(15 million, $8)
3	(25 million, $6)	(20 million, $7)
4	(30 million, $7)	(25 million, $6)
5	(35 million, $8)	(30 million, $5)
6	(40 million, $9)	(35 million, $4)

When we combine the demand and supply curves for a good in a single graph, the point at which they intersect identifies the equilibrium price and equilibrium quantity. Here, the equilibrium price is $6 per pound. Consumers demand, and suppliers supply, 25 million pounds of coffee per month at this price. With an upward-sloping supply curve (S) and a downward-sloping demand curve (D), there is only a single price at which the two curves intersect. This means there is only one price at which equilibrium is achieved. It follows that at any price other than the equilibrium price, the market will not be in equilibrium. We next examine what happens at prices other than the equilibrium price.

Surpluses

Figure 3.4b A Surplus in the Market for Coffee shows the same demand and supply curves we have just examined, but this time the initial price is $8 per pound of coffee. Because we no longer have a balance between **quantity demanded** and **quantity supplied**, this price is not the equilibrium price. At a price of $8, we read over to the demand curve to determine the quantity of coffee consumers will be willing to buy—15 million pounds per month. The supply curve tells us what sellers will offer for sale—35 million pounds per month. The difference, 20 million pounds of coffee per month, is called a surplus. More generally, a surplus is the amount by which the quantity supplied exceeds the quantity demanded at the current price. There is, of course, no surplus at the equilibrium price; a surplus occurs only if the current price exceeds the equilibrium price.

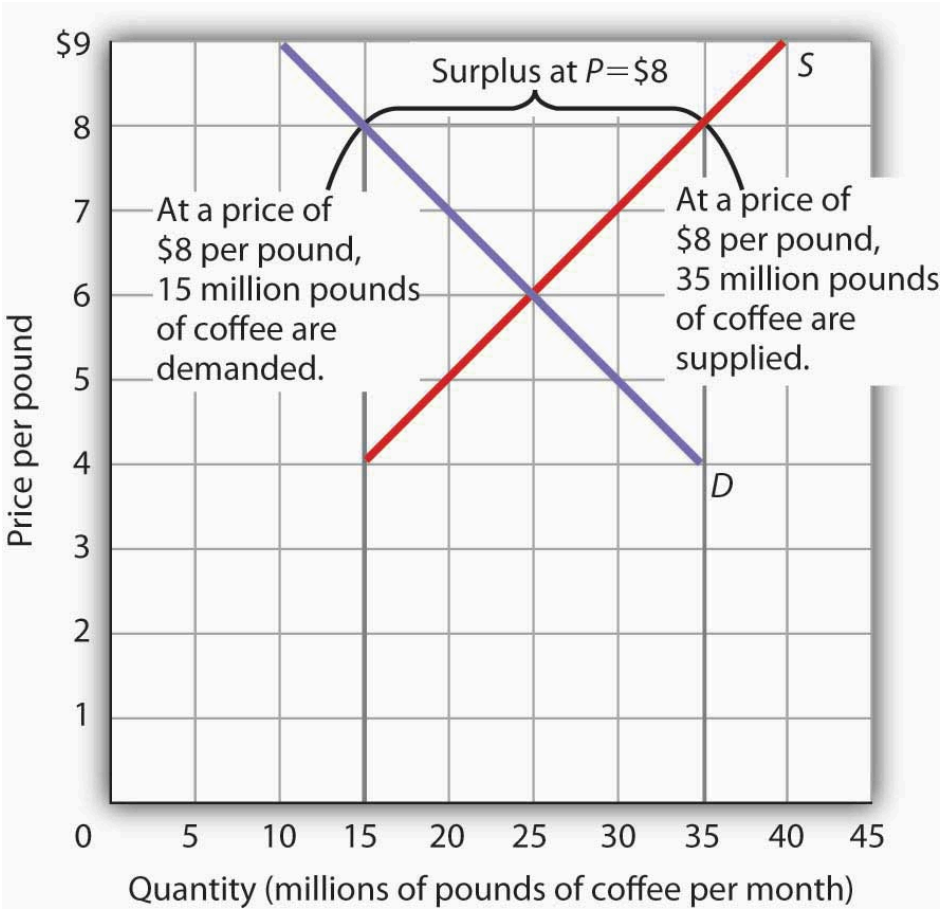


Figure 3.4b A Surplus in the Market for Coffee. Figure by University of Minnesota, licensed under CC BY-NC-SA 4.0.

Figure 3.4b A Surplus in the Market for Coffee

Figure 3.4b has a vertical axis of Price per pound ($) and horizontal axis of Quantity (millions of pounds of coffee per month). An upward sloping supply curve (S) and and downward sloping demand curve (D) intersecting at 15 millions of pounds of coffee per month and $6 per pound. At a price of $8, the quantity supplied is 35 million pounds of coffee per month and the quantity demanded is 15 million pounds per month; there is a surplus of 20 million pounds of coffee per month. The surplus is at price of $8. Given a surplus, the price will fall quickly toward the equilibrium level of $6.

Table 3.4b A Surplus in the Market for Coffee

Points	Supply Curve (S) (Quantity, Price)	Demand Curve (D) (Quantity, Price)
1	(15 million, $4)	(10 million, $9)
2	(20 million, $5)	(15 million, $8)
3	(25 million, $6)	(20 million, $7)
4	(30 million, $7)	(25 million, $6)
5	(35 million, $8)	(30 million, $5)
6	(40 million, $9)	(35 million, $4)

At a price of $8, the quantity supplied is 35 million pounds of coffee per month and the quantity demanded is 15 million pounds per month; there is a surplus of 20 million pounds of coffee per month. The surplus is at price of $8. Given a surplus, the price will fall quickly toward the equilibrium level of $6.

A surplus in the market for coffee will not last long. With unsold coffee on the market, sellers will begin to reduce their prices to clear out unsold coffee. As the price of coffee begins to fall, the quantity of coffee supplied begins to decline. At the same time, the quantity of coffee demanded begins to rise. Remember that the reduction in quantity supplied is a movement *along* the supply curve—the curve itself does not shift in response to a reduction in price. Similarly, the increase in quantity demanded is a movement *along* the demand curve—the demand curve does not shift in response to a reduction in price. Price will continue to fall until it reaches its equilibrium level, at which the demand and supply curves intersect. At that point, there will be no tendency for price to fall further. In general, surpluses in the marketplace are short-lived. The prices of most goods and services adjust quickly, eliminating the surplus. Later on, we will discuss some markets in which adjustment of price to equilibrium may occur only very slowly or not at all.

Shortages

Just as a price above the equilibrium price will cause a surplus, a price below equilibrium will cause a shortage. A shortage is the amount by which the quantity demanded exceeds the quantity supplied at the current price.

Figure 3.4c "A Shortage in the Market for Coffee" shows a shortage in the market for coffee. Suppose the price is $4 per pound. At that price, 15 million pounds of coffee would be supplied per month, and 35 million pounds would be demanded per month. When more coffee is demanded than supplied, there is a shortage.

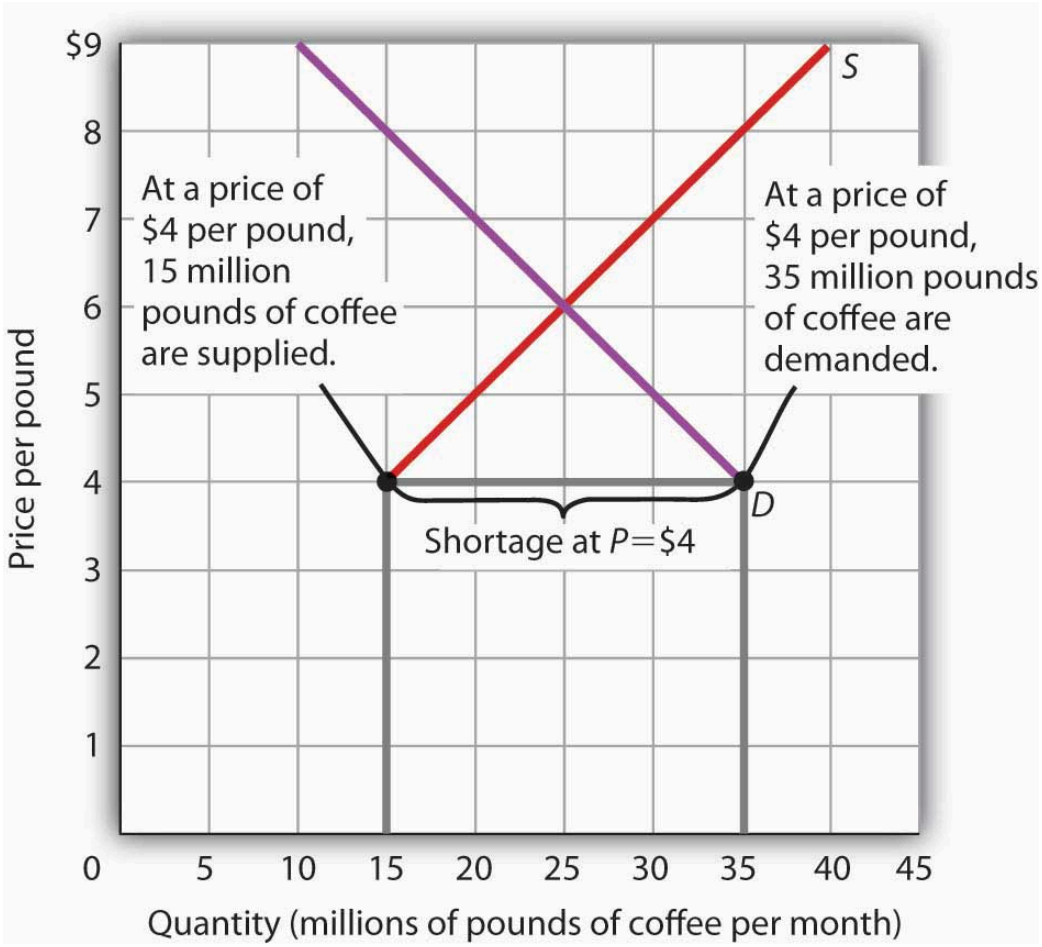


Figure 3.4c A Shortage in the Market for Coffee. Figure by University of Minnesota, licensed under CC BY-NC-SA 4.0.

Figure 3.4c A Shortage in the Market for Coffee Textual Version

Figure 3.4c has a vertical axis of Price per pound ($) and horizontal axis of Quantity (millions of pounds of coffee per month). An upward sloping supply curve (S) and and downward sloping demand curve (D) intersect at 15 million and $6 per pound. At a price of $4 per pound, the quantity of coffee demanded is 35 million pounds per month and the quantity supplied is 15 million pounds per month. The shortage is at price of $4. The result is a shortage of 20 million pounds of coffee per month.

Table 3.4c A Shortage in the Market for Coffee

Points	Supply Curve (S) (Quantity millions of pounds per month, Price per pound)	Demand Curve (D) (Quantity millions of pounds per month, Price per pound)
1	15 million, 4 dollars	10 million, 9 dollars
2	20 million, 5 dollars	15 million, 8 dollars
3	25 million, 6 dollar	20 million, 7 dollars
4	30 million, 7 dollars	25 million, 6 dollars
5	35 million, 8 dollars	30 million, 5 dollars
6	40 million, 9 dollars	35 million, 4 dollars

At a price of $4 per pound, the quantity of coffee demanded is 35 million pounds per month and the quantity supplied is 15 million pounds per month. The shortage is at price of $4. The result is a shortage of 20 million pounds of coffee per month.

In the face of a shortage, sellers are likely to begin to raise their prices. As the price rises, there will be an increase in the quantity supplied (but not a change in supply) and a reduction in the quantity demanded (but not a change in demand) until the equilibrium price is achieved.

Shifts in Demand and Supply

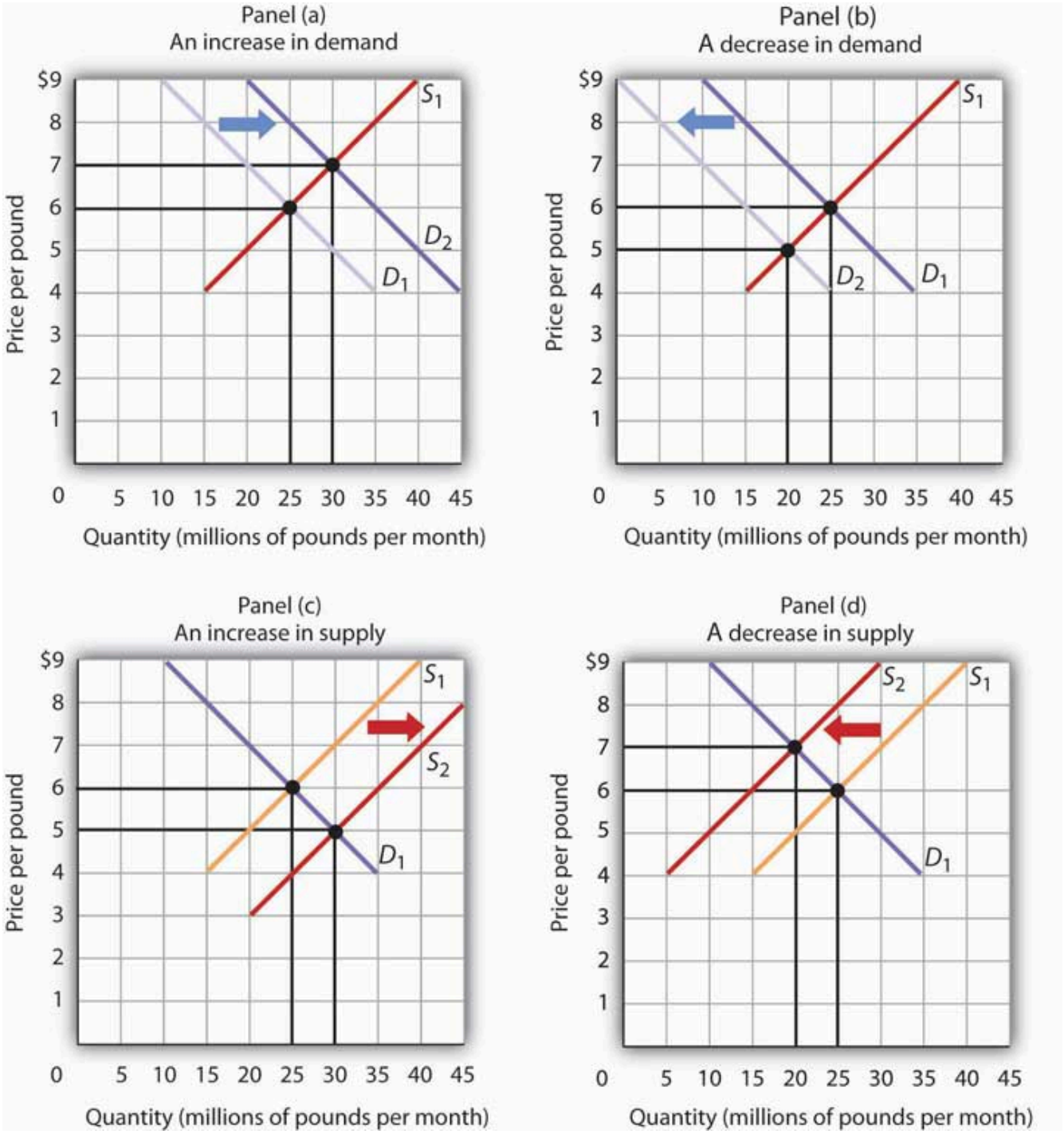


Figure 3.4d Changes in Demand and Supply. A change in demand or in supply changes the equilibrium solution in the model. Panels (a) and (b) show an increase and a decrease in demand, respectively; Panels (c) and (d) show an increase and a decrease in supply, respectively. Figure by University of Minnesota, licensed under CC BY-NC-SA 4.0.

Figure 3.4d Changes in Demand and Supply Textual Version

Figure depicts four graphs. The vertical axis is Price per pound (dollars) and a horizontal axis Quantity (millions of pounds per month). The equilibrium occurs where supply and demand curves intersect.

Panel (a) depicts an increase in demand. Supply Curve (S_1) is linear sloping upward from left to right. The Demand Curve (D1) is linear sloping downward left to right and intersects with S1 at 25 million pounds per month and 6 dollars per pound. D1 shifts to the right to D2 and now intersects S1 at 30 million pounds per month and 7 dollars per pound.

Table 3.4d Panel A: Changes in Demand and Supply

Points	**Supply Curve (S_1) (Quantity millions of pounds per month, Price per pound)**	**Demand Curve (D_1) (Quantity millions of pounds per month, Price per pound)**	**Demand Curve (D_2) (Quantity millions of pounds per month, Price per pound)**
1	15 million pounds , 4 dollars	35 million pounds , 4 dollars	45 million pounds , 4 dollars
2	20 million pounds, 5 dollars	30 million pounds , 5 dollars	40 million pounds , 5 dollars
3	25 million pounds , 6 dollars	25 million pounds , 6 dollars	35 million pounds , 6 dollars
4	30 million pounds , 7 dollars	20 million pounds , 7 dollars	30 million pounds , 7 dollars
5	35 million pounds , 8 dollars	15 million pounds , 8 dollars	25 million pounds , 8 dollars
6	40 million pounds , 9 dollars	10 million pounds , 9 dollars	20 million pounds , 9 dollars

Panel (b) depicts a decrease in demand. Supply Curve (S_1) is linear sloping upward from left to right. The Demand Curve (D_1) is linear sloping downward left to right and intersects with S_1 at 25 million pounds per month and 6 dollars per pound. D1 shifts to the left to D_2 and now intersects S_1 at 20 million pounds per month and 5 dollars per pound.

Table 3.4e Panel B: Changes in Demand and Supply

Points	Supply Curve (S_1) (Quantity millions of pounds per month, Price per pound)	Demand Curve (D_1) (Quantity millions of pounds per month, Price per pound)	Demand Curve (D_2) (Quantity millions of pounds per month, Price per pound)
1	15 million pounds , 4 dollars	35 million pounds , 4 dollars	25 million pounds , 4 dollars
2	20 million pounds , 5 dollars	30 million pounds , 5 dollars	20 million pounds , 5 dollars
3	25 million pounds , 6 dollars	25 million pounds , 6 dollars	15 million pounds , 6 dollars
4	30 million pounds , 7 dollars	20 million pounds , 7 dollars	10 million pounds , 7 dollars
5	35 million pounds , 8 dollars	15 million pounds , 8 dollars	5 million pounds , 8 dollars
6	40 million pounds , 9 dollars	10 million pounds , 9 dollars	0 million pounds , 9 dollars

Panel (c) depicts an increase in supply. The Demand Curve (D_1) is linear sloping downward left to right and intersects with S1 at 25 million pounds per month and 6 dollars per pound. Supply Curve (S_1) is linear sloping upward from left to right. The S1 shifts to the right to S_2 and now intersects D_1 at 30 million pounds per month and 5 dollars per pound.

Table 3.4f Panel C: Changes in Demand and Supply

Points	Supply Curve (S_1) (Quantity millions of pounds per month, Price per pound)	Supply Curve (S_2) (Quantity millions of pounds per month, Price per pound)	Demand Curve (D_1) (Quantity millions of pounds per month, Price per pound)
1	15 million pounds , 4 dollars	20 million pounds , 3 dollars	35 million pounds , 4 dollars
2	20 million pounds , 5 dollars	25 million pounds , 4 dollars	30 million pounds , 5 dollars
3	25 million pounds , 6 dollars	30 million pounds , 5 dollars	25 million pounds, 6 dollars
4	30 million pounds , 7 dollars	35million pounds , 6 dollars	20 million pounds , 7 dollars
5	35 million pounds , 8 dollars	40 million pounds , 7 dollars	15 million pounds , 8 dollars
6	40 million pounds, 9 dollars	45 million pounds , 8 dollars	10 million pounds , 9 dollars

Panel (d) depicts a decrease in supply. The Demand Curve (D_1) is linear sloping downward left to right and intersects with S_1 at 25 million pounds per month and 6 dollars per pound. Supply Curve (S_1) is linear sloping upward from left to right. The S_1 shifts to the left to S_2 and now intersects D_1 at 20 million pounds per month and 7 dollars per pound.

Table 3.4g Changes in Demand and Supply: Panel D

Points	Supply Curve (S_1) (Quantity millions of pounds per month, Price per pound)	Supply Curve (S_2) (Quantity millions of pounds per month, Price per pound)	Demand Curve (D_1) (Quantity millions of pounds per month, Price per pound)
1	15 million pounds , 4 dollars	5 million pounds , 4 dollars	35 million pounds , 4 dollars
2	20 million pounds , 5 dollars	10 million pounds , 5 dollars	30 million pounds , 5 dollars
3	25 million pounds , 6 dollars	15 million pounds , 6 dollars	25 million pounds , 6 dollars
4	30 million pounds , 7 dollars	20 million pounds , 7 dollars	20 million pounds , 7 dollars
5	35 million pounds , 8 dollars	25 million pounds , 8 dollars	15 million pounds , 8 dollars
6	40 million pounds , 9 dollars	30 million pounds , 9 dollars	10 million pounds , 9 dollars

A change in one of the variables (shifters) held constant in any model of demand and supply will create a change in demand or supply. A shift in a demand or supply curve changes the equilibrium price and equilibrium quantity for a good or service. Figure 3.4d "Changes in Demand and Supply" combines the information about changes in the demand and supply of coffee presented in Figure 3.1b "An Increase in Demand" Figure 3.1c "A Reduction in Demand" Figure 3.2b "An Increase in Supply" and Figure 3.2c "A Reduction in Supply" In each case, the original equilibrium price is $6 per pound, and the corresponding equilibrium quantity is 25 million pounds of coffee per month. Figure 3.4d "Changes in Demand and Supply" shows what happens with an increase in demand, a reduction in demand, an increase in supply, and a reduction in supply. We then look at what happens if both curves shift simultaneously. Each of these possibilities is discussed in turn below.

An Increase in Demand

An increase in demand for coffee shifts the demand curve to the right, as shown in Panel (a) of Figure 3.4d "Changes in Demand and Supply". The equilibrium price rises to $7 per pound. As the price rises to the new equilibrium level, the quantity supplied increases to 30 million pounds of coffee per month. Notice that the supply curve does not shift; rather, there is a movement along the supply curve.

Demand shifters that could cause an increase in demand include a shift in preferences that leads to greater coffee consumption; a lower price for a complement to coffee, such as doughnuts; a higher price for a substitute for coffee, such as tea; an increase in income; and an increase in population. A change in buyer expectations, perhaps due to predictions of bad weather lowering expected yields on coffee plants and increasing future coffee prices, could also increase current demand.

A Decrease in Demand

Panel (b) of Figure 3.4d "Changes in Demand and Supply" shows that a decrease in demand shifts the demand curve to the left. The equilibrium price falls to $5 per pound. As the price falls to the new equilibrium level, the quantity supplied decreases to 20 million pounds of coffee per month.

Demand shifters that could reduce the demand for coffee include a shift in preferences that makes people want to consume less coffee; an increase in the price of a complement, such as doughnuts; a reduction in the price of a substitute, such as tea; a reduction in income; a reduction in population; and a change in buyer expectations that leads people to expect lower prices for coffee in the future.

An Increase in Supply

An increase in the supply of coffee shifts the supply curve to the right, as shown in Panel (c) of Figure 3.4d "Changes in Demand and Supply". The equilibrium price falls to $5 per pound. As the price falls to the new equilibrium level, the quantity of coffee demanded increases to 30 million pounds of coffee per month. Notice that the demand curve does not shift; rather, there is movement along the demand curve.

Possible supply shifters that could increase supply include a reduction in the price of an input such as labour, a decline in the returns available from alternative uses of the **inputs** that produce coffee, an improvement in the technology of coffee production, good weather, and an increase in the number of coffee-producing firms.

A Decrease in Supply

Panel (d) of Figure 3.4d "Changes in Demand and Supply" shows that a decrease in supply shifts the supply curve to the left. The equilibrium price rises to $7 per pound. As the price rises to the new equilibrium level, the quantity demanded decreases to 20 million pounds of coffee per month.

Possible supply shifters that could reduce supply include an increase in the prices of inputs used in the production of coffee, an increase in the returns available from alternative uses of these inputs, a decline in production because of problems in technology (perhaps caused by a restriction on pesticides used to protect coffee beans), a reduction in the number of coffee-producing firms, or a natural event, such as excessive rain.

Heads Up!

Figure 3.4e Textual Version

Figure 3.4e contains 3 graphs. All 3 graphs have the same axis: the vertical axis is price per pound (P) and the horizontal axis is quantity (lb of peas per month) (Q).

1. Graph 1 – Set up the graph: depicts a linear supply curve (S_1) that slopes upward left to right and a linear demand curve (D_1) sloping downward left to right. D_1 and S_1 intersect in the middle at point (Q_1, P_1).
2. Graph 2 -Shift the curve: depicts original supply curve (S_1) shifting to the left to supply curve (S_2) intersecting further up D_1 at a new point (Q_2, P_2).
3. Graph 3 -Troubleshoot: depicts S_1 and D_2 intersecting at (Q_1, P_1). The original demand curve (D_1) shifts to the left to D_2, intersecting further down the supply curve (S_1). Overlaying the graph is a circle with an two lines intersecting in an 'x' extending the diameter of the circle.

You are likely to be given problems in which you will have to shift a demand or supply curve.

Suppose you are told that an invasion of pod-crunching insects has gobbled up half the crop of fresh peas, and you are asked to use demand and supply analysis to predict what will happen to the price and quantity of peas demanded and supplied. Here are some suggestions.

Put the quantity of the good you are asked to analyze on the horizontal axis and its price on the vertical axis. Draw a downward-sloping line for demand and an upward-sloping line for supply. The initial equilibrium price is determined by the intersection of the two curves. Label the equilibrium solution. You may find it helpful to use a number for the equilibrium price instead of the letter "P." Pick a price that seems plausible, say, 79¢ per pound. Do not worry about the precise positions of the demand and supply curves; you cannot be expected to know what they are.

Step 2 can be the most difficult step; the problem is to decide which curve to shift. The key is to remember the difference between a change in demand or supply and a change in quantity demanded or supplied. At each price, ask yourself whether the given event would change the quantity demanded. Would the fact that a bug has attacked the pea crop change the quantity demanded at a price of, say, 79¢ per pound? Clearly not; none of the demand shifters have changed. The event would, however, reduce the quantity supplied at this price, and the supply curve would shift to the left. There is a change in supply and a reduction in the quantity demanded. There is no change in demand.

Next check to see whether the result you have obtained makes sense. The graph in Step 2 makes sense; it shows price rising and quantity demanded falling.

It is easy to make a mistake such as the one shown in the third figure of this Heads Up! One might, for example, reason that when fewer peas are available, fewer will be demanded, and therefore the demand curve will shift to the left. This suggests the price of peas will fall—but that does not make sense. If only half as many fresh peas were available, their price would surely rise. The error here lies in confusing a change in quantity demanded with a change in demand. Yes, buyers will end up buying fewer peas. But no, they will not demand fewer peas at each price than before; the demand curve does not shift.

Simultaneous Shifts

As we have seen, when *either* the demand or the supply curve shifts, the results are unambiguous; that is, we know what will happen to both equilibrium price and equilibrium quantity, so long as we know whether demand or supply increased or decreased. However, in practice, several events may occur at around the same time that cause *both* the demand and supply curves to shift. To figure out what happens to equilibrium price and equilibrium quantity, we must know not only in which direction the demand and supply curves have shifted but also the relative amount by which each curve shifts. Of course, the demand and supply curves could shift in the same direction or in opposite directions, depending on the specific events causing them to shift.

For example, all three panels of Figure 3.4f "Simultaneous Decreases in Demand and Supply" show a decrease in demand for coffee (caused perhaps by a decrease in the price of a substitute good, such as tea) and a

simultaneous decrease in the supply of coffee (caused perhaps by bad weather). Since reductions in demand and supply, considered separately, each cause the equilibrium quantity to fall, the impact of both curves shifting simultaneously to the left means that the new equilibrium quantity of coffee is less than the old equilibrium quantity. The effect on the equilibrium price, though, is ambiguous. Whether the equilibrium price is higher, lower, or unchanged depends on the extent to which each curve shifts. The vertical axis is price per pound and the horizontal axis is quantity (millions of pounds per month). The Supply Curve is linear sloping upwards from left to right and the Demand Curve is linear sloping downwards from left to right.

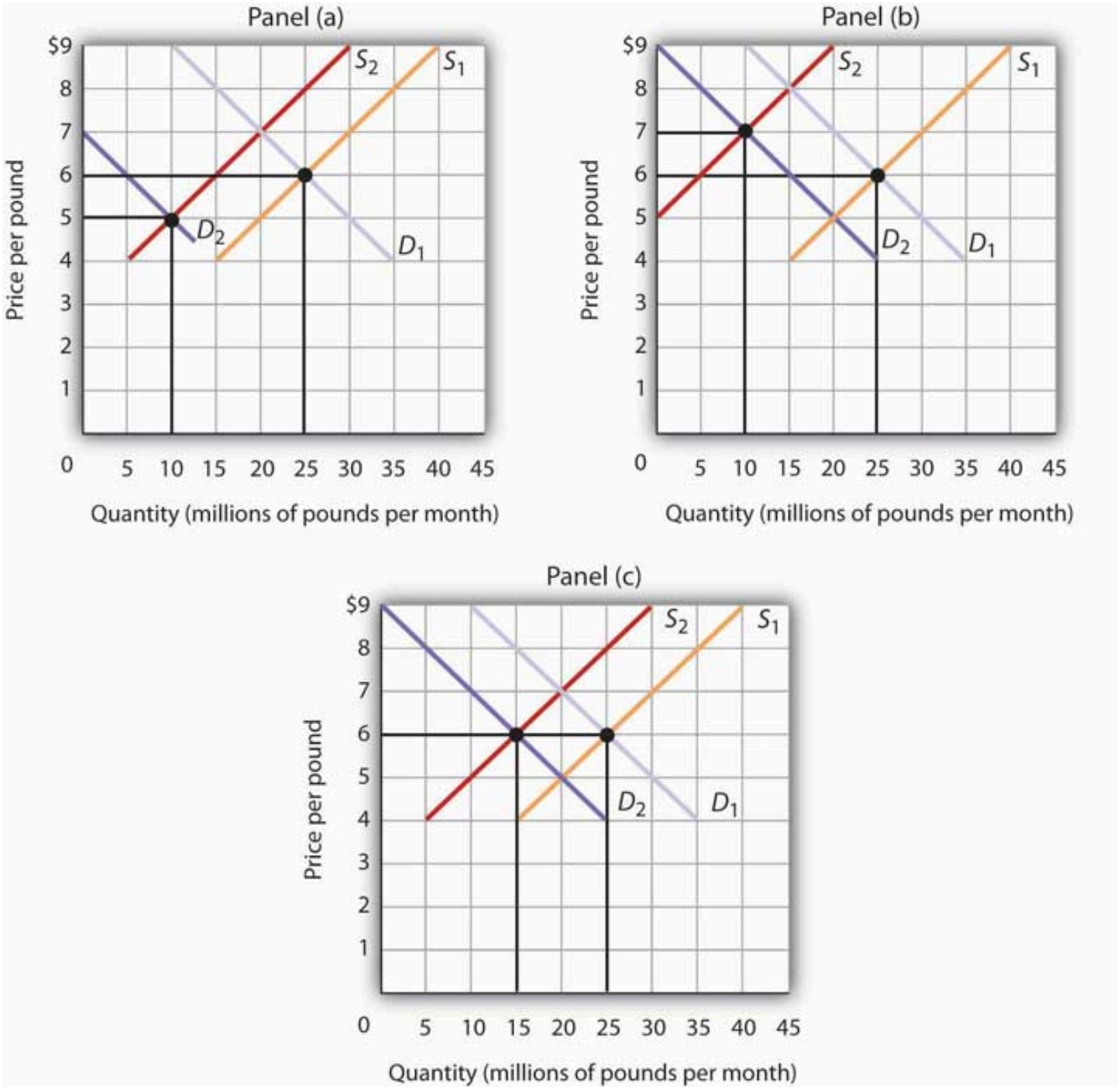


Figure 3.4f Simultaneous Decreases in Demand and Supply. Figure by University of Minnesota, licensed under CC BY-NC-SA 4.0.

Both the demand and the supply of coffee decrease. Since decreases in demand and supply, considered separately, each cause equilibrium quantity to fall, the impact of both decreasing simultaneously means that a new equilibrium quantity of coffee must be less than the old equilibrium quantity. In Panel (a), the demand curve shifts farther to the left than does the supply curve, so equilibrium price falls. In Panel (b), the supply curve shifts farther to the left than does the demand curve, so the equilibrium price rises. In Panel (c), both curves shift to the left by the same amount, so equilibrium price stays the same.

If the demand curve shifts farther to the left than does the supply curve, as shown in Panel (a) of Figure 3.4f "Simultaneous Decreases in Demand and Supply", then the equilibrium price will be lower than it was before the curves shifted. In this case the new equilibrium price falls from $6 per pound to $5 per pound. If the shift to the left of the supply curve is greater than that of the demand curve, the equilibrium price will be higher than it was before, as shown in Panel (b). In this case, the new equilibrium price rises to $7 per pound. In Panel (c), since both curves shift to the left by the same amount, equilibrium price does not change; it remains $6 per pound.

Regardless of the scenario, changes in equilibrium price and equilibrium quantity resulting from two different events need to be considered separately. If both events cause equilibrium price or quantity to move in the same direction, then clearly price or quantity can be expected to move in that direction. If one event causes price or quantity to rise while the other causes it to fall, the extent by which each curve shifts is critical to figuring out what happens. Figure 3.4g "Simultaneous Shifts in Demand and Supply" summarizes what may happen to equilibrium price and quantity when demand and supply both shift.

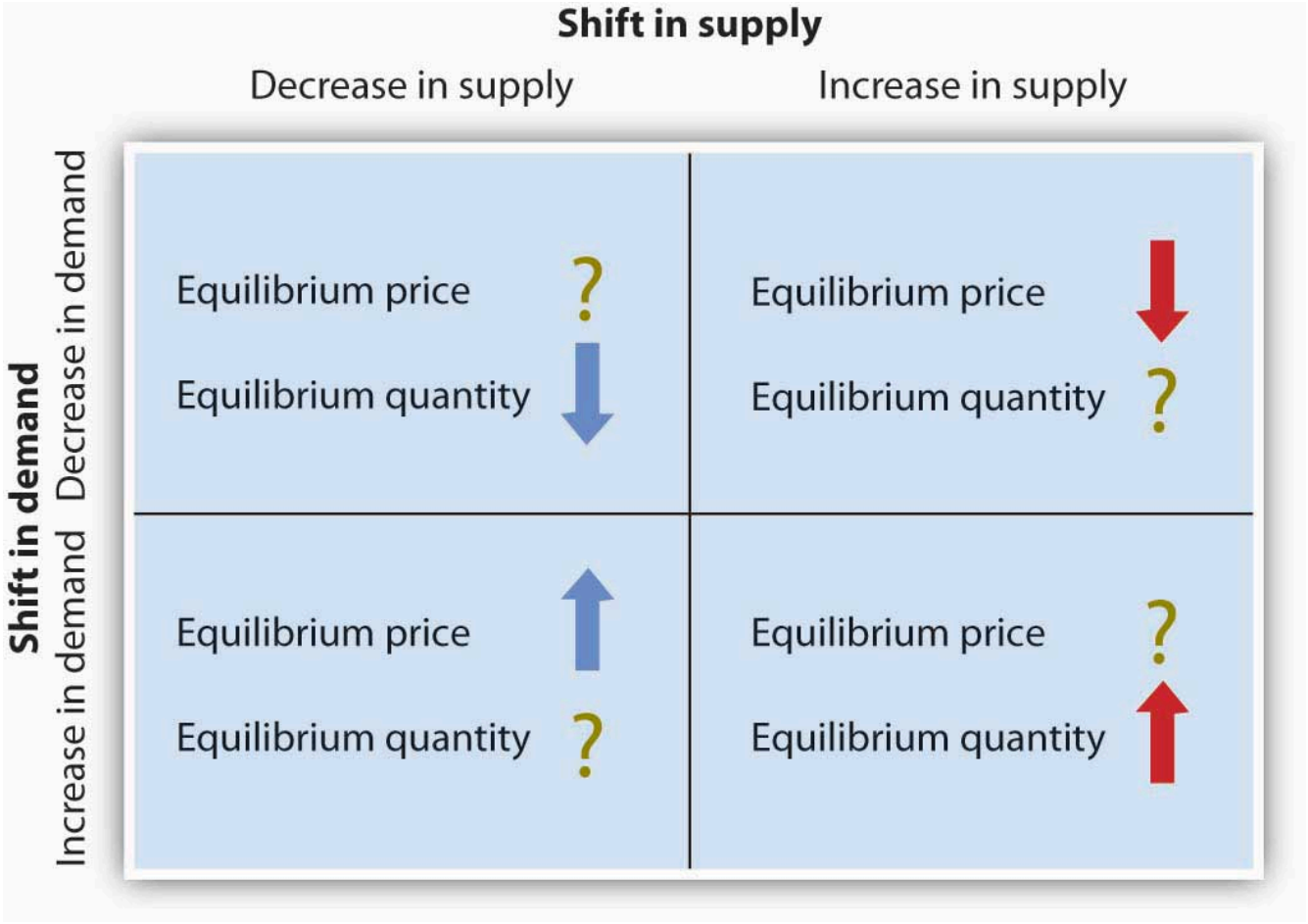


Figure 3.4g Simultaneous Shifts in Demand and Supply. Figure by University of Minnesota, licensed under CC BY-NC-SA 4.0.

If simultaneous shifts in demand and supply cause equilibrium price or quantity to move in the same direction, then equilibrium price or quantity clearly moves in that direction. If the shift in one of the curves causes equilibrium price or quantity to rise while the shift in the other curve causes equilibrium price or quantity to fall, then the relative amount by which each curve shifts is critical to figuring out what happens to that variable.

As demand and supply curves shift, prices adjust to maintain a balance between the quantity of a good demanded and the quantity supplied. If prices did not adjust, this balance could not be maintained.

Notice that the demand and supply curves that we have examined in this chapter have all been drawn as linear. This simplification of the real world makes the graphs a bit easier to read without sacrificing the essential point: whether the curves are linear or nonlinear, demand curves are downward sloping and supply curves are generally upward sloping. As circumstances that shift the demand curve or the supply curve change, we can analyze what will happen to price and what will happen to quantity.

An Overview of Demand and Supply: The Circular Flow Model

Implicit in the concepts of demand and supply is a constant interaction and adjustment that economists illustrate with the circular flow model. The circular flow model provides a look at how markets work and how they are related to each other. It shows flows of spending and income through the economy.

A great deal of economic activity can be thought of as a process of exchange between households and firms. Firms supply goods and services to households. Households buy these goods and services from firms. Households supply factors of production—labour, capital, and natural resources—that firms require. The payments firms make in exchange for these factors represent the incomes households earn.

The flow of goods and services, factors of production, and the payments they generate is illustrated in Figure 3.4h "The Circular Flow of Economic Activity". This circular flow model of the economy shows the interaction of households and firms as they exchange goods and services and factors of production. For simplicity, the model here shows only the private domestic economy; it omits the government and foreign sectors.

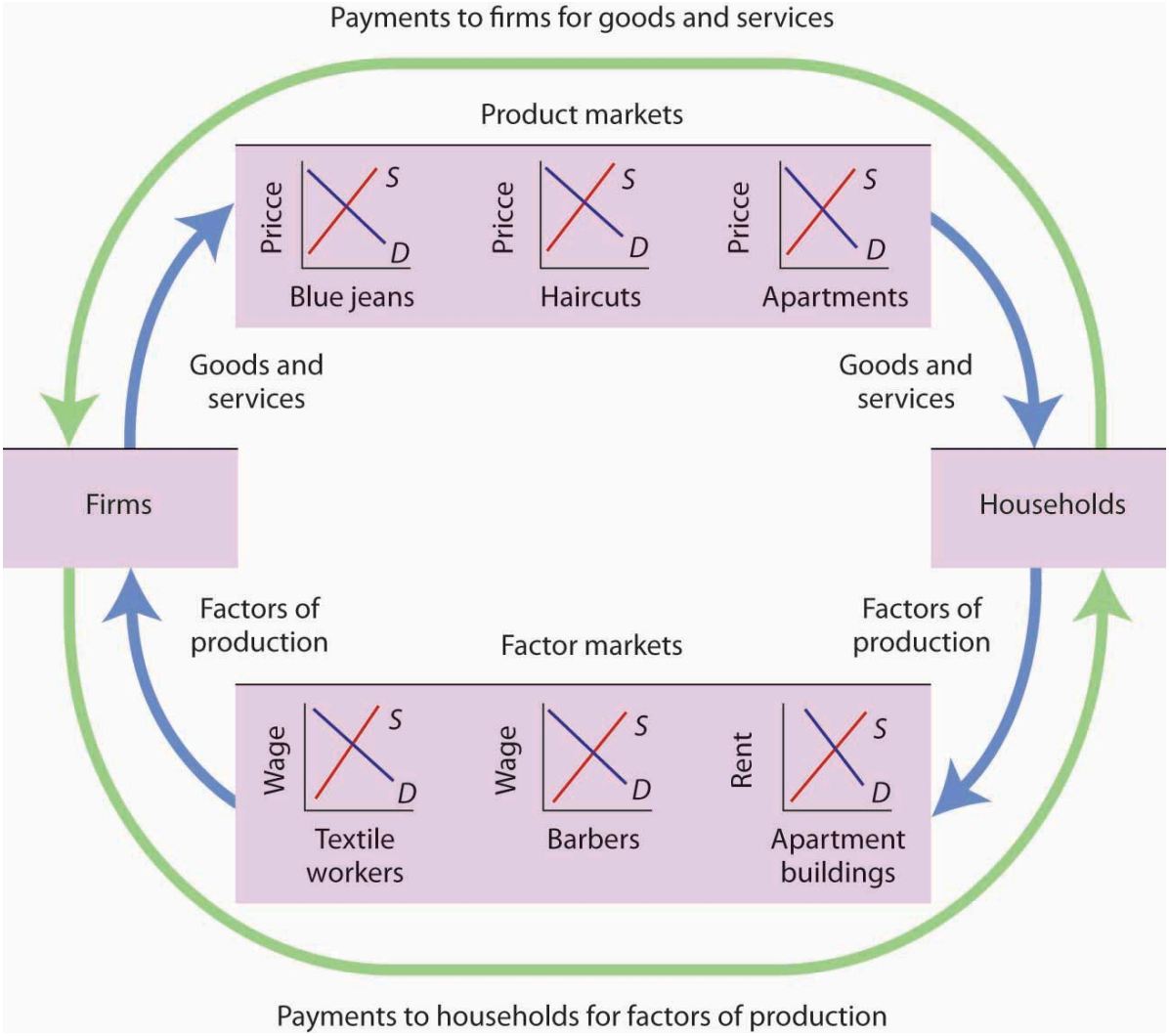


Figure 3.4h The Circular Flow of Economic Activity. Figure by University of Minnesota, licensed under CC BY-NC-SA 4.0.

This simplified circular flow model shows flows of spending between households and firms through product and factor markets. The inner arrows show goods and services flowing from firms to households and factors of production flowing from households to firms. The outer flows show the payments for goods, services, and factors of production. These flows, in turn, represent millions of individual markets for products and factors of production.

The circular flow model shows that goods and services that households demand are supplied by firms in product markets. The exchange for goods and services is shown in the top half of Figure 3.4h "The Circular Flow of Economic Activity". The bottom half of the exhibit illustrates the exchanges that take place in factor markets. factor markets are markets in which households supply factors of production—labour, capital, and natural resources—demanded by firms.

Our model is called a circular flow model because households use the income they receive from their supply of factors of production to buy goods and services from firms. Firms, in turn, use the payments they receive from households to pay for their factors of production.

The demand and supply model developed in this chapter gives us a basic tool for understanding what is happening in each of these product or factor markets and also allows us to see how these markets are interrelated. In Figure 3.4h "The Circular Flow of Economic Activity", markets for three goods and services that households want—blue jeans, haircuts, and apartments—create demands by firms for textile workers, barbers, and apartment buildings. The equilibrium of supply and demand in each market determines the price and quantity of that item. Moreover, a change in equilibrium in one market will affect equilibrium in related markets. For example, an increase in the demand for haircuts would lead to an increase in demand for barbers. Equilibrium price and quantity could rise in both markets. For some purposes, it will be adequate to simply look at a single market, whereas at other times we will want to look at what happens in related markets as well.

In either case, the model of demand and supply is one of the most widely used tools of economic analysis. That widespread use is no accident. The model yields results that are, in fact, broadly consistent with what we observe in the marketplace. Your mastery of this model will pay big dividends in your study of economics.

Key Takeaways

- The equilibrium price is the price at which the quantity demanded equals the quantity supplied. It is determined by the intersection of the demand and supply curves.
- A surplus exists if the quantity of a good or service supplied exceeds the quantity demanded at the current price; it causes downward pressure on price. A shortage exists if the quantity of a good or service demanded exceeds the quantity supplied at the current price; it causes upward pressure on price.
- An increase in demand, all other things unchanged, will cause the equilibrium price to rise; quantity supplied will increase. A decrease in demand will cause the equilibrium price to fall; quantity supplied will decrease.
- An increase in supply, all other things unchanged, will cause the equilibrium price to fall; quantity demanded will increase. A decrease in supply will cause the equilibrium price to rise; quantity demanded will decrease.

- To determine what happens to equilibrium price and equilibrium quantity when both the supply and demand curves shift, you must know in which direction each of the curves shifts and the extent to which each curve shifts.
- The circular flow model provides an overview of demand and supply in product and factor markets and suggests how these markets are linked to one another.

Try It!

What happens to the equilibrium price and the equilibrium quantity of DVD rentals if the price of movie theater tickets increases and wages paid to DVD rental store clerks increase, all other things unchanged? Be sure to show all possible scenarios, as was done in Figure 3.4f "Simultaneous Decreases in Demand and Supply". Again, you do not need actual numbers to arrive at an answer. Just focus on the general position of the curve(s) before and after events occurred.

Check your Answer

An increase in the price of movie theater tickets (a substitute for DVD rentals) will cause the demand curve for DVD rentals to shift to the right. An increase in the wages paid to DVD rental store clerks (an increase in the cost of a factor of production) shifts the supply curve to the left. Each event taken separately causes equilibrium price to rise. Whether equilibrium quantity will be higher or lower depends on which curve shifted more.

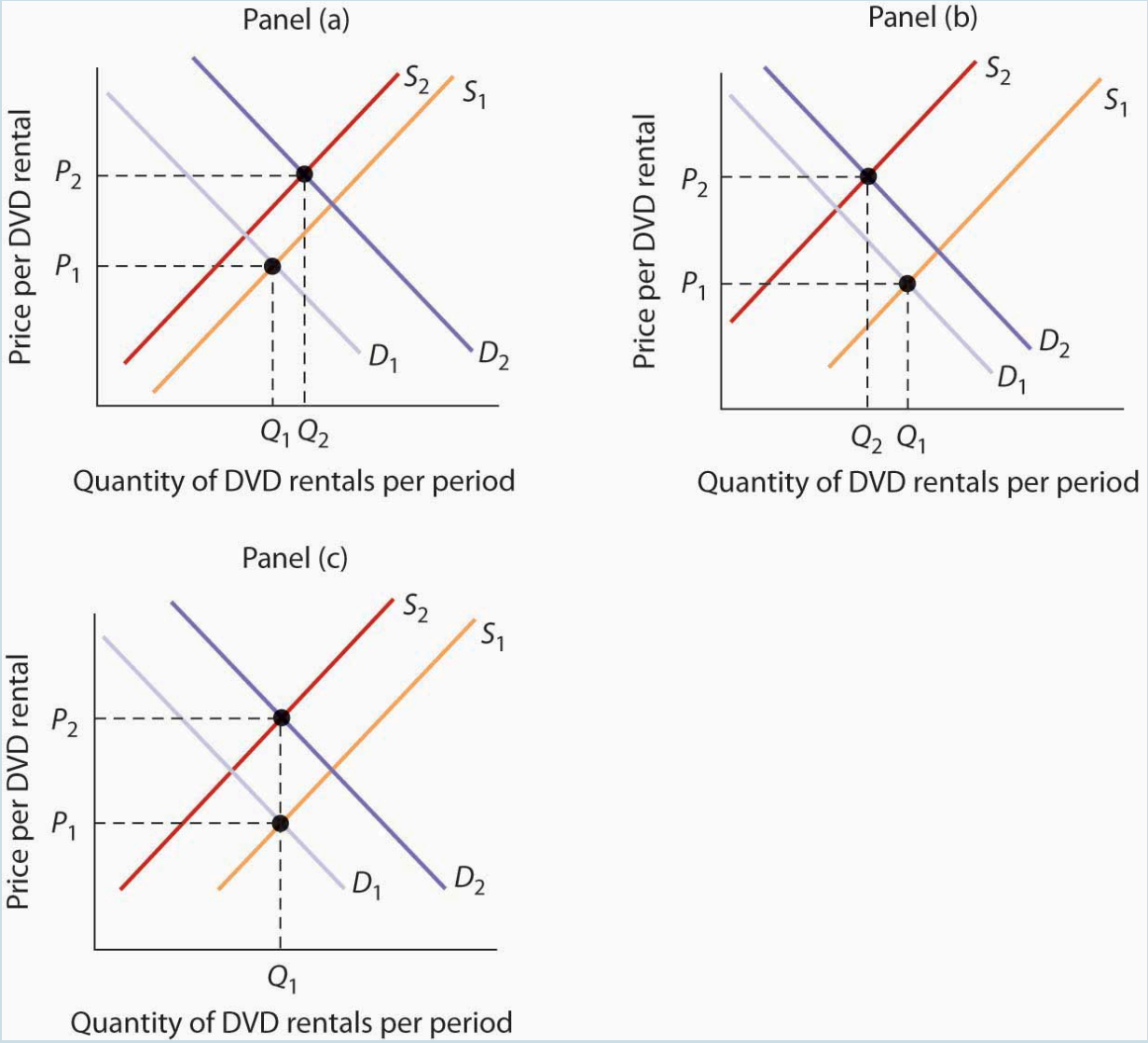


Figure 3.4i. Figure by University of Minnesota, licensed under CC BY-NC-SA 4.0.

Figure 3.4i Textual Version

Figure 3.4i contains 3 graphs: panel (a), panel (b) and panel (c). All graphs have the same vertical and horizontal axes: the vertical axis is price per DVD rental (P) and the horizontal axis is quantity of DVD rentals per period (Q). The original supply curve (S_1) is linear sloping upward from left to right and the original demand curve (D_1) is linear sloping downwards from left to right.

Panel (a) depicts if the demand curve shifted more, then the equilibrium quantity of DVD rentals will rise. The supply curve (S_1) occurs in the central are of the graph and the demand curve (D_1) is further to the left of the graph. S_1 and D_1 intersect at point (Q_1, P_1). S_1 shifts to the left to S_2 and D_1

shifts substantially to the right to D_2. S_2 and D_2 now intersect at (Q_2, P_2), further right along the supply curve in the centre area of the graph.

Panel (b) depicts if the supply curve shifted more, then the equilibrium quantity of DVD rentals will fall. The supply curve (S_1) occurs further to the right on the graph and the demand curve (D_1) is further to the left. S_1 and D_1 intersect at point (Q_1, P_1). S_1 shifts to substantially to the left to S_2 and D_1 shifts right to D_2. S_2 and D_2 now intersect at (Q_2, P_2), further right along the supply curve towards the left area of the graph.

Panel (c) depicts if the curves shifted by the same amount, then the equilibrium quantity of DVD rentals would not change. The supply curve (S_1) occurs further to the right on the graph and the demand curve (D_1) is further to the left. S_1 and D_1 intersect at point (Q_1, P_1). S_1 shifts to the left to S_2 and D_1 shifts right to D_2. S_2 and D_2 now intersect at (Q_1, P_2), further right along the supply curve in the central area of the graph.

Case in Point: Demand, Supply, and Obesity

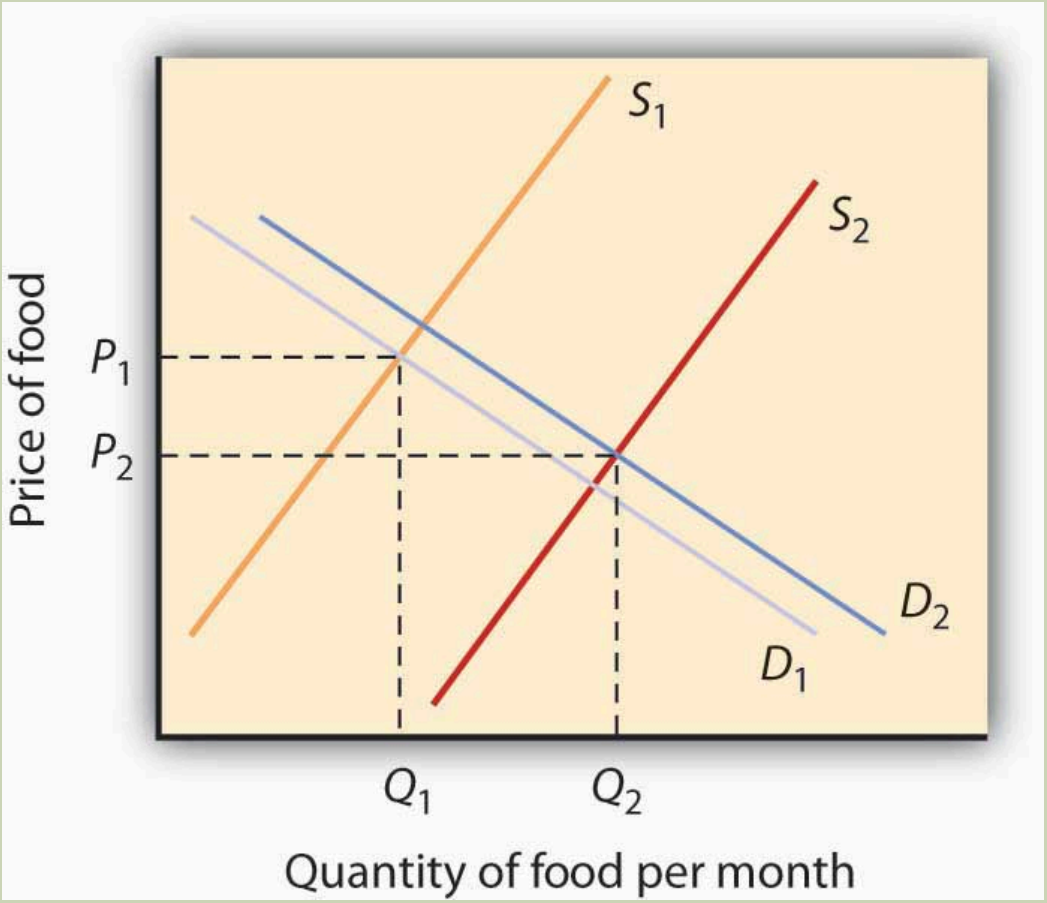
Figure 3.4j American fat beauty (https://www.flickr.com/photos/23300509@N03/2229513184) by rattopennugu, licensed under CC BY-NC-ND 2.0.

Why are so many Americans fat? Put so crudely, the question may seem rude, but, indeed, the number of obese Americans has increased by more than 50% over the last generation, and obesity may now be the nation's number one health problem. According to Sturm Roland in a recent RAND Corporation study, "Obesity appears to have a stronger association with the occurrence of chronic medical conditions, reduced physical health-related quality of life and increased health care and medication expenditures than smoking or problem drinking."

Many explanations of rising obesity suggest higher demand for food. What more apt picture of our sedentary life style is there than spending the afternoon watching a ballgame on TV, while eating chips and salsa, followed by a dinner of a lavishly topped, take-out pizza? Higher income has also undoubtedly contributed to a rightward shift in the demand curve for food. Plus, any additional food intake translates into more weight increase because we spend so few calories preparing it, either directly or in the process of earning the income to buy it. A study by economists Darius Lakdawalla and Tomas Philipson suggests that about 60% of the recent growth in weight may be

explained in this way—that is, demand has shifted to the right, leading to an increase in the equilibrium quantity of food consumed and, given our less strenuous life styles, even more weight gain than can be explained simply by the increased amount we are eating.

What accounts for the remaining 40% of the weight gain? Lakdawalla and Philipson further reason that a rightward shift in demand would by itself lead to an increase in the quantity of food as well as an increase in the price of food. The problem they have with this explanation is that over the post-World War II period, the relative price of food has declined by an average of 0.2 percentage points per year. They explain the fall in the price of food by arguing that agricultural innovation has led to a substantial rightward shift in the supply curve of food. As shown in Figure 3.23, lower food prices and a higher equilibrium quantity of food have resulted from simultaneous rightward shifts in demand and supply and that the rightward shift in the supply of food from S_1 to S_2 has been substantially larger than the rightward shift in the demand curve from D_1 to D_2.



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3.5 - DEMAND, SUPPLY, AND EQUILIBRIUM IN MARKETS FOR GOODS AND SERVICES

Learning Objectives

- Explain demand, quantity demanded, and the law of demand
- Identify a demand curve and a supply curve
- Explain supply, quantity supplied, and the law of supply
- Explain equilibrium, equilibrium price, and equilibrium quantity

First let's first focus on what economists mean by demand, what they mean by supply, and then how demand and supply interact in a market.

Demand for Goods and Services

Economists use the term **demand** to refer to the amount of some good or service consumers are willing and able to purchase at each price. Demand is fundamentally based on needs and wants—if you have no need or want for something, you won't buy it. While a consumer may be able to differentiate between a need and a want, from an economist's perspective they are the same thing. Demand is also based on ability to pay. If you cannot pay for it, you have no effective demand. By this definition, a homeless person probably has no effective demand for shelter.

What a buyer pays for a unit of the specific good or service is called price. The total number of units that consumers would purchase at that price is called the quantity demanded. A rise in price of a good or service almost always decreases the quantity demanded of that good or service. Conversely, a fall in price will increase the quantity demanded. When the price of a gallon of gasoline increases, for example, people look for ways to reduce their consumption by combining several errands, commuting by carpool or mass transit, or taking weekend or vacation trips closer to home. Economists call this inverse relationship between price and quantity

demanded the **law of demand**. The law of demand assumes that all other variables that affect demand (which we explain in the next module) are held constant.

We can show an example from the market for gasoline in a table or a graph. Economist call a table that shows the quantity demanded at each price, such as Table 3.5a, a **demand schedule**. In this case we measure price in dollars per gallon of gasoline. We measure the quantity demanded in millions of gallons over some time period (for example, per day or per year) and over some geographic area (like a state or a country). A **demand curve** shows the relationship between price and quantity demanded on a graph like Figure 3.5a, with quantity on the horizontal axis and the price per gallon on the vertical axis. (Note that this is an exception to the normal rule in mathematics that the independent variable (x) goes on the horizontal axis and the dependent variable (y) goes on the vertical. Economics is not math.)

Table 3.5a shows the demand schedule and the graph in Figure 3.5a shows the demand curve. These are two ways to describe the same relationship between price and quantity demanded.

Table 3.5a Price and Quantity Demanded of Gasoline

Price (per gallon) ($)	Quantity Demanded (millions of gallons)
1.00	800
1.20	700
1.40	600
1.60	550
1.80	500
2.00	460
2.20	420

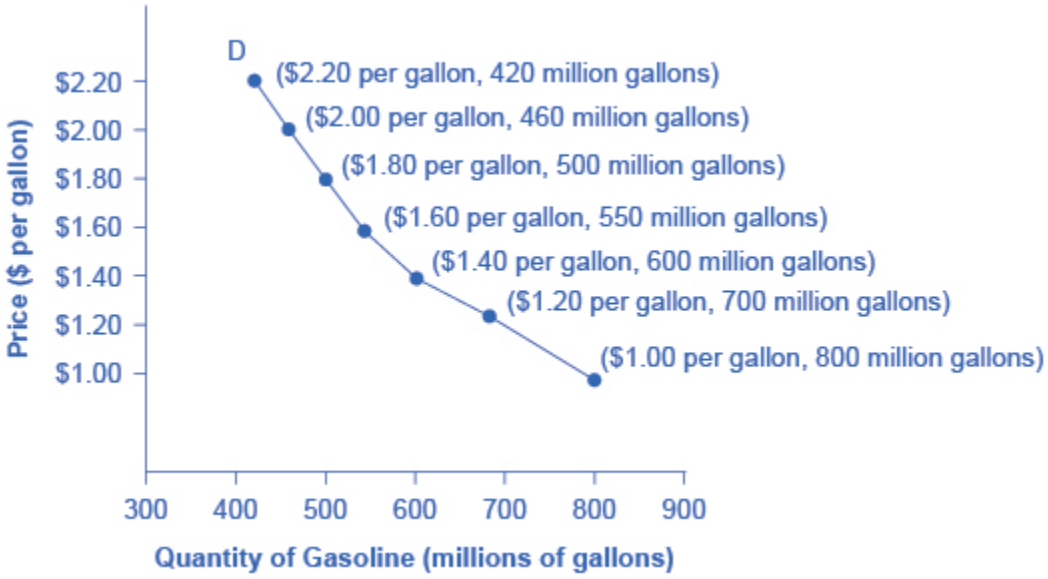

Figure 3.5a A Demand Curve for Gasoline. The demand schedule shows that as price rises, quantity demanded decreases, and vice versa. We graph these points, and the line connecting them is the demand curve (D). The downward slope of the demand curve again illustrates the law of demand—the inverse relationship between prices and quantity demanded. A Demand Curve for Gasoline by Steven A. Greenlaw & David Shapiro (OpenStax), licensed under CC BY 4.0.

Demand curves will appear somewhat different for each product. They may appear relatively steep or flat, or they may be straight or curved. Nearly all demand curves share the fundamental similarity that they slope down from left to right. Demand curves embody the law of demand: As the price increases, the quantity demanded decreases, and conversely, as the price decreases, the quantity demanded increases.

Confused about these different types of demand? Read the next Clear It Up feature.

Clear it Up: Is demand the same as quantity demanded?

In economic terminology, demand is not the same as quantity demanded. When economists talk about demand, they mean the relationship between a range of prices and the quantities demanded at those prices, as illustrated by a demand curve or a demand schedule. When economists talk about quantity demanded, they mean only a certain point on the demand curve, or one quantity on the demand schedule. In short, demand refers to the curve and quantity demanded refers to the (specific) point on the curve.

Supply of Goods and Services

When economists talk about **supply**, they mean the amount of some good or service a producer is willing to supply at each price. Price is what the producer receives for selling one unit of a good or service. A rise in price almost always leads to an increase in the quantity supplied of that good or service, while a fall in price will decrease the quantity supplied. When the price of gasoline rises, for example, it encourages profit-seeking firms to take several actions: expand exploration for oil reserves; drill for more oil; invest in more pipelines and oil tankers to bring the oil to plants for refining into gasoline; build new oil refineries; purchase additional pipelines and trucks to ship the gasoline to gas stations; and open more gas stations or keep existing gas stations open longer hours. Economists call this positive relationship between price and quantity supplied—that a higher price leads to a higher quantity supplied and a lower price leads to a lower quantity supplied—the **law of supply**. The law of supply assumes that all other variables that affect supply (to be explained in the next module) are held constant.

Still unsure about the different types of supply? See the following Clear It Up feature.

Clear it Up: Is supply the same as quantity supplied?

In economic terminology, supply is not the same as quantity supplied. When economists refer to supply, they mean the relationship between a range of prices and the quantities supplied at those prices, a relationship that we can illustrate with a supply curve or a supply schedule. When economists refer to quantity supplied, they mean only a certain point on the supply curve, or one quantity on the supply schedule. In short, supply refers to the curve and quantity supplied refers to the (specific) point on the curve.

Figure 3.5b illustrates the law of supply, again using the market for gasoline as an example. Like demand, we can illustrate supply using a table or a graph. A **supply schedule** is a table, like Table 3.5b, that shows the quantity supplied at a range of different prices. Again, we measure price in dollars per gallon of gasoline and we measure quantity supplied in millions of gallons. A **supply curve** is a graphic illustration of the relationship between price, shown on the vertical axis, and quantity, shown on the horizontal axis. The supply schedule and the supply curve are just two different ways of showing the same information. Notice that the horizontal and vertical axes on the graph for the supply curve are the same as for the demand curve.

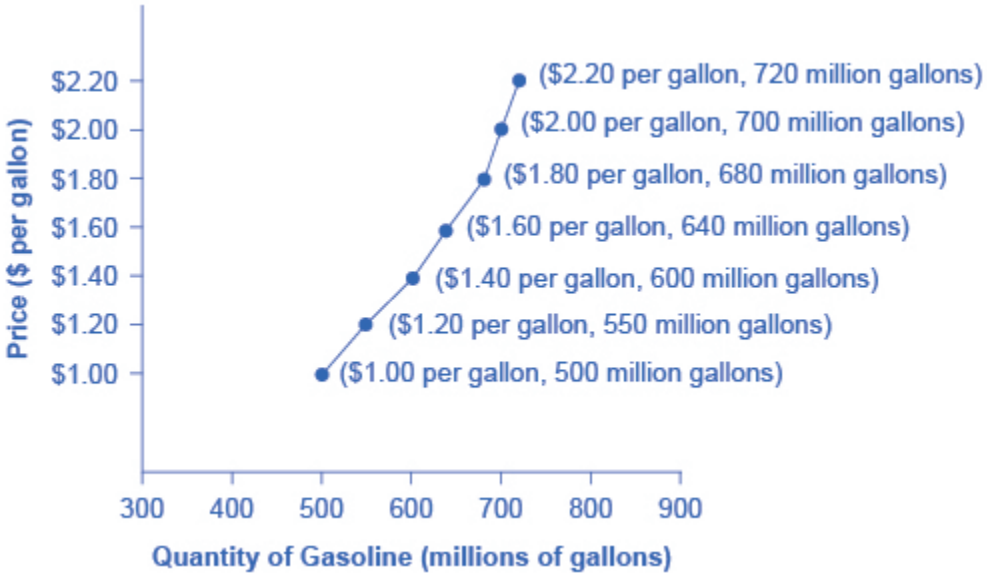

Figure 3.5b. A Supply Curve for Gasoline. The supply schedule is the table that shows quantity supplied of gasoline at each price. As price rises, quantity supplied also increases, and vice versa. The supply curve (S) is created by graphing the points from the supply schedule and then connecting them. The upward slope of the supply curve illustrates the law of supply—that a higher price leads to a higher quantity supplied, and vice versa. A Supply Curve for Gasoline by Steven A. Greenlaw & David Shapiro (OpenStax), licensed under CC BY 4.0.

Table 3.5b. Price and Supply of Gasoline

Price (per gallon) ($)	Quantity Supplied (millions of gallons)
1.00	500
1.20	550
1.40	600
1.60	640
1.80	680
2.00	700
2.20	720

The shape of supply curves will vary somewhat according to the product: steeper, flatter, straighter, or curved. Nearly all supply curves, however, share a basic similarity: they slope up from left to right and illustrate the law of supply: as the price rises, say, from $1.00 per gallon to $2.20 per gallon, the quantity supplied increases from 500 gallons to 720 gallons. Conversely, as the price falls, the quantity supplied decreases.

Equilibrium—Where Demand and Supply Intersect

Because the graphs for demand and supply curves both have price on the vertical axis and quantity on the horizontal axis, the demand curve and supply curve for a particular good or service can appear on the same graph. Together, demand and supply determine the price and the quantity that will be bought and sold in a market.

Figure 3.5c illustrates the interaction of demand and supply in the market for gasoline. The demand curve (D) is identical to Figure 3.5a. The supply curve (S) is identical to Figure 3.5b. Table 3.5b contains the same information in tabular form.

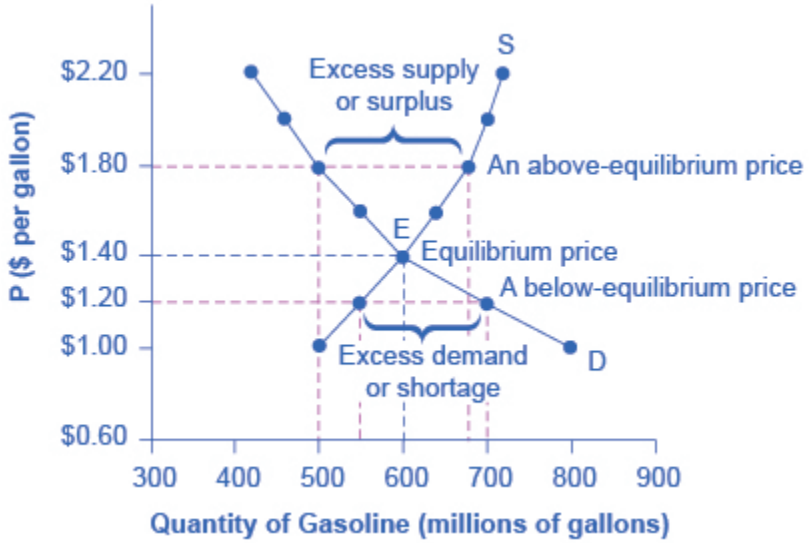

Figure 3.5c Demand and Supply for Gasoline. The demand curve (D) and the supply curve (S) intersect at the equilibrium point E, with a price of $1.40 and a quantity of 600. The equilibrium is the only price where quantity demanded is equal to quantity supplied. At a price above equilibrium like $1.80, quantity supplied exceeds the quantity demanded, so there is excess supply. At a price below equilibrium such as $1.20, quantity demanded exceeds quantity supplied, so there is excess demand.Demand and Supply for Gasoline by Steven A. Greenlaw & David Shapiro (OpenStax), licensed under CC BY 4.0.

Table 3.5c Price, Quantity Demanded, and Quantity Supplied

Price ($ per gallon)	Demand Curve (D): Quantity demanded (millions of gallons)	Supply Curve (S) : Quantity supplied (millions of gallons)
1.00	800	500
1.20	700	550
1.40	**600**	**600**
1.60	550	640
1.80	500	680
2.00	460	700
2.20	420	720

Remember this: When two lines on a diagram cross, this intersection usually means something. Supply curve (S) slopes concave upwards from left to right. Demand curve (D) slopes downward concave from left to right. The point where the supply curve (S) and the demand curve (D) cross, designated by point E (price of $1.40 and a quantity of 600) in Figure 3.5c, is called the equilibrium. The **equilibrium price** is the only price where the plans of consumers and the plans of producers agree—that is, where the amount of the product consumers want to buy (quantity demanded) is equal to the amount producers want to sell (quantity supplied). Economists call this common quantity the **equilibrium quantity**. At any other price, the quantity demanded does not equal the quantity supplied, so the market is not in equilibrium at that price.

In Figure 3.5c, the equilibrium price is $1.40 per gallon of gasoline and the equilibrium quantity is 600 million gallons. If you had only the demand and supply schedules, and not the graph, you could find the equilibrium by looking for the price level on the tables where the quantity demanded and the quantity supplied are equal.

The word "equilibrium" means "balance." If a market is at its equilibrium price and quantity, then it has no reason to move away from that point. However, if a market is not at equilibrium, then economic pressures arise to move the market toward the equilibrium price and the equilibrium quantity.

Imagine, for example, that the price of a gallon of gasoline was above the equilibrium price—that is, instead of $1.40 per gallon, the price is $1.80 per gallon. The dashed horizontal line at the price of $1.80 in Figure 3.5c illustrates this above equilibrium price. At this higher price, the quantity demanded drops from 600 to 500. This decline in quantity reflects how consumers react to the higher price by finding ways to use less gasoline.

Moreover, at this higher price of $1.80, the quantity of gasoline supplied rises from the 600 to 680, as the higher price makes it more profitable for gasoline producers to expand their output. Now, consider how quantity demanded and quantity supplied are related at this above-equilibrium price. Quantity demanded has

fallen to 500 gallons, while quantity supplied has risen to 680 gallons. In fact, at any above-equilibrium price, the quantity supplied exceeds the quantity demanded. We call this an excess supply or a **surplus**.

With a surplus, gasoline accumulates at gas stations, in tanker trucks, in pipelines, and at oil refineries. This accumulation puts pressure on gasoline sellers. If a surplus remains unsold, those firms involved in making and selling gasoline are not receiving enough cash to pay their workers and to cover their expenses. In this situation, some producers and sellers will want to cut prices, because it is better to sell at a lower price than not to sell at all. Once some sellers start cutting prices, others will follow to avoid losing sales. These price reductions in turn will stimulate a higher quantity demanded. Therefore, if the price is above the equilibrium level, incentives built into the structure of demand and supply will create pressures for the price to fall toward the equilibrium.

Now suppose that the price is below its equilibrium level at $1.20 per gallon, as the dashed horizontal line at this price in Figure 3.5c shows. At this lower price, the quantity demanded increases from 600 to 700 as drivers take longer trips, spend more minutes warming up the car in the driveway in wintertime, stop sharing rides to work, and buy larger cars that get fewer miles to the gallon. However, the below-equilibrium price reduces gasoline producers' incentives to produce and sell gasoline, and the quantity supplied falls from 600 to 550.

When the price is below equilibrium, there is **excess demand**, or a **shortage**—that is, at the given price the quantity demanded, which has been stimulated by the lower price, now exceeds the quantity supplied, which had been depressed by the lower price. In this situation, eager gasoline buyers mob the gas stations, only to find many stations running short of fuel. Oil companies and gas stations recognize that they have an opportunity to make higher profits by selling what gasoline they have at a higher price. As a result, the price rises toward the equilibrium level.

Key Concepts and Summary

A demand schedule is a table that shows the quantity demanded at different prices in the market. A demand curve shows the relationship between quantity demanded and price in a given market on a graph. The law of demand states that a higher price typically leads to a lower quantity demanded.

A supply schedule is a table that shows the quantity supplied at different prices in the market. A supply curve shows the relationship between quantity supplied and price on a graph. The law of supply says that a higher price typically leads to a higher quantity supplied.

The equilibrium price and equilibrium quantity occur where the supply and demand curves cross. The equilibrium occurs where the quantity demanded is equal to the quantity supplied. If the price is below the equilibrium level, then the quantity demanded will exceed the quantity supplied. Excess demand or a shortage will exist. If the price is above the equilibrium level, then the quantity supplied will exceed the quantity demanded. Excess supply or a surplus will exist. In either case, economic pressures will push the price toward the equilibrium level.

Attribution

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3.6 - SHIFTS IN DEMAND AND SUPPLY FOR GOODS AND SERVICES

Learning Objectives

- Identify factors that affect demand
- Graph demand curves and demand shifts
- Identify factors that affect supply
- Graph supply curves and supply shifts

The previous module explored how price affects the quantity demanded and the quantity supplied. The result was the demand curve and the supply curve. Price, however, is not the only factor that influences buyers' and sellers' decisions. For example, how is demand for vegetarian food affected if, say, health concerns cause more consumers to avoid eating meat? How is the supply of diamonds affected if diamond producers discover several new diamond mines? What are the major factors, in addition to the price, that influence demand or supply?

Link It Up

Visit this The Delicious Truth: Chilean Sea Bass = Patagonian Toothfish [New Tab] (http://thedelicioustruth.blogspot.com/2009/08/chilean-sea-bass-patagonian-toothfish.html)to read a brief note on how marketing strategies can influence supply and demand of products.

What Factors Affect Demand?

We defined demand as the amount of some product a consumer is willing and able to purchase at each price. That suggests at least two factors that affect demand. Willingness to purchase suggests a desire, based on what economists call tastes and preferences. If you neither need nor want something, you will not buy it. Ability to purchase suggests that income is important. Professors are usually able to afford better housing and transportation than students, because they have more income. Prices of related goods can affect demand also. If you need a new car, the price of a Honda may affect your demand for a Ford. Finally, the size or composition of the population can affect demand. The more children a family has, the greater their demand for clothing. The more driving-age children a family has, the greater their demand for car insurance, and the less for diapers and baby formula.

These factors matter for both individual and market demand as a whole. Exactly how do these various factors affect demand, and how do we show the effects graphically? To answer those questions, we need the ***ceteris paribus*** assumption.

The *Ceteris Paribus* Assumption

A demand curve or a supply curve is a relationship between two, and only two, variables: quantity on the horizontal axis and price on the vertical axis. The assumption behind a demand curve or a supply curve is that no relevant economic factors, other than the product's price, are changing. Economists call this assumption ceteris paribus, a Latin phrase meaning "other things being equal." Any given demand or supply curve is based on the *ceteris paribus* assumption that all else is held equal. A demand curve or a supply curve is a relationship between two, and only two, variables when all other variables are kept constant. If all else is not held equal, then the laws of supply and demand will not necessarily hold, as the following Clear It Up feature shows.

Clear It Up

When does *ceteris paribus* apply?

We typically apply *ceteris paribus* when we observe how changes in price affect demand or supply, but we can apply *ceteris paribus* more generally. In the real world, demand and supply depend on more factors than just price. For example, a consumer's demand depends on income and a producer's supply depends on the cost of producing the product. How can we analyze the effect on demand or supply if multiple factors are changing at the same time—say price rises and income falls? The answer is that we examine the changes one at a time, assuming the other factors are held constant.

For example, we can say that an increase in the price reduces the amount consumers will buy (assuming income, and anything else that affects demand, is unchanged). Additionally, a decrease in income reduces the amount consumers can afford to buy (assuming price, and anything else that affects demand, is unchanged). This is what the *ceteris paribus* assumption really means. In this particular case, after we analyze each factor separately, we can combine the results. The amount consumers buy falls for two reasons: first because of the higher price and second because of the lower income.

How Does Income Affect Demand?

Let's use income as an example of how factors other than price affect demand. Figure 3.6a shows the initial demand for automobiles as D_0. At point Q, for example, if the price is $20,000 per car, the quantity of cars demanded is 18 million. D_0 also shows how the quantity of cars demanded would change as a result of a higher or lower price. For example, if the price of a car rose to $22,000, the quantity demanded would decrease to 17 million, at point R.

The original demand curve D_0, like every demand curve, is based on the *ceteris paribus* assumption that no other economically relevant factors change. Now imagine that the economy expands in a way that raises the incomes of many people, making cars more affordable. How will this affect demand? How can we show this graphically?

Return to Figure 3.6a. The price of cars is still $20,000, but with higher incomes, the quantity demanded has now increased to 20 million cars, shown at point S. As a result of the higher income levels, the demand curve shifts to the right to the new demand curve D_1, indicating an increase in demand. Table 3.6a shows clearly that this increased demand would occur at every price, not just the original one.

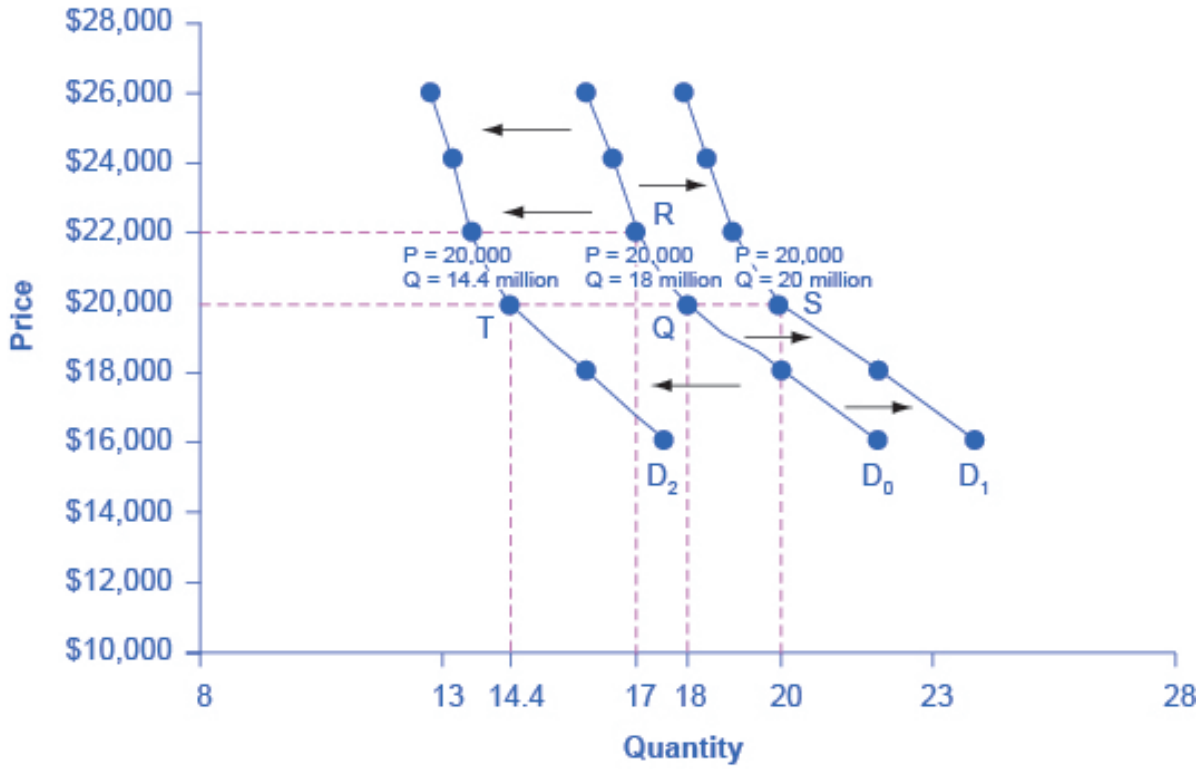

Figure 3.6a Shifts in Demand: A Car Example. Increased demand means that at every given price, the quantity demanded is higher, so that the demand curve shifts to the right from D_0 to D_1. Decreased demand means that at every given price, the quantity demanded is lower, so that the demand curve shifts to the left from D_0 to D_2. Graph by Steven A. Greenlaw & David Shapiro (OpenStax), licensed under CC BY 4.0.

Table 3.6a Price and Demand Shifts: A Car Example

Price ($)	Decrease to D_2	Original Quantity Demanded D_0	Increase to D_1
16,000	17.6 million	22.0 million	24.0 million
18,000	16.0 million	20.0 million	22.0 million
20,000	14.4 million	18.0 million	20.0 million
22,000	13.6 million	17.0 million	19.0 million
24,000	13.2 million	16.5 million	18.5 million
26,000	12.8 million	16.0 million	18.0 million

Now, imagine that the economy slows down so that many people lose their jobs or work fewer hours, reducing their incomes. In this case, the decrease in income would lead to a lower quantity of cars demanded at every given price, and the original demand curve D_0 would shift left to D_2. The shift from D_0 to D_2 represents such a decrease in demand: At any given price level, the quantity demanded is now lower. In this example, a price of $20,000 means 18 million cars sold along the original demand curve, but only 14.4 million

sold after demand fell.

When a demand curve shifts, it does not mean that the quantity demanded by every individual buyer changes by the same amount. In this example, not everyone would have higher or lower income and not everyone would buy or not buy an additional car. Instead, a shift in a demand curve captures a pattern for the market as a whole.

In the previous section, we argued that higher income causes greater demand at every price. This is true for most goods and services. For some—luxury cars, vacations in Europe, and fine jewellery—the effect of a rise in income can be especially pronounced. A product whose demand rises when income rises, and vice versa, is called a **normal good**. A few exceptions to this pattern do exist. As incomes rise, many people will buy fewer generic brand groceries and more name brand groceries. They are less likely to buy used cars and more likely to buy new cars. They will be less likely to rent an apartment and more likely to own a home. A product whose demand falls when income rises, and vice versa, is called an **inferior good**. In other words, when income increases, the demand curve shifts to the left.

Other Factors That Shift Demand Curves

Income is not the only factor that causes a **shift in demand**. Other factors that change demand include tastes and preferences, the composition or size of the population, the prices of related goods, and even expectations. A change in any one of the underlying factors that determine what quantity people are willing to buy at a given price will cause a shift in demand. Graphically, the new demand curve lies either to the right (an increase) or to the left (a decrease) of the original demand curve. Let's look at these factors.

Changing Tastes or Preferences

From 1980 to 2014, the per-person consumption of chicken by Americans rose from 48 pounds per year to 85 pounds per year, and consumption of beef fell from 77 pounds per year to 54 pounds per year, according to the U.S. Department of Agriculture (USDA). Changes like these are largely due to movements in taste, which change the quantity of a good demanded at every price: that is, they shift the demand curve for that good, rightward for chicken and leftward for beef.

Changes in the Composition of the Population

The proportion of elderly citizens in the United States population is rising. It rose from 9.8% in 1970 to 12.6% in 2000, and will be a projected (by the U.S. Census Bureau) 20% of the population by 2030. A society with relatively more children, like the United States in the 1960s, will have greater demand for goods and services like tricycles and day care facilities. A society with relatively more elderly persons, as the United States is projected to have by 2030, has a higher demand for nursing homes and hearing aids. Similarly, changes in

the size of the population can affect the demand for housing and many other goods. Each of these changes in demand will be shown as a shift in the demand curve.

Changes in the Prices of Related Goods

Changes in the prices of related goods such as **substitutes** or **complements** also can affect the demand for a product. A substitute is a good or service that we can use in place of another good or service. As electronic books, like this one, become more available, you would expect to see a decrease in demand for traditional printed books. A lower price for a substitute decreases demand for the other product. For example, in recent years as the price of tablet computers has fallen, the quantity demanded has increased (because of the law of demand). Since people are purchasing tablets, there has been a decrease in demand for laptops, which we can show graphically as a leftward shift in the demand curve for laptops. A higher price for a substitute good has the reverse effect.

Other goods are complements for each other, meaning we often use the goods together, because consumption of one good tends to enhance consumption of the other. Examples include breakfast cereal and milk; notebooks and pens or pencils, golf balls and golf clubs; gasoline and sport utility vehicles; and the five-way combination of bacon, lettuce, tomato, mayonnaise, and bread. If the price of golf clubs rises, since the quantity demanded of golf clubs falls (because of the law of demand), demand for a complement good like golf balls decreases, too. Similarly, a higher price for skis would shift the demand curve for a complement good like ski resort trips to the left, while a lower price for a complement has the reverse effect.

Changes in Expectations about Future Prices or Other Factors that Affect Demand

While it is clear that the price of a good affects the quantity demanded, it is also true that expectations about the future price (or expectations about tastes and preferences, income, and so on) can affect demand. For example, if people hear that a hurricane is coming, they may rush to the store to buy flashlight batteries and bottled water. If people learn that the price of a good like coffee is likely to rise in the future, they may head for the store to stock up on coffee now. We show these changes in demand as shifts in the curve. Therefore, a shift in demand happens when a change in some economic factor (other than price) causes a different quantity to be demanded at every price. The following Work It Out feature shows how this happens.

Work It Out: Shift in Demand

A shift in demand means that at any price (and at every price), the quantity demanded will be different than it was before. Following is an example of a shift in demand due to an income increase.

Step 1. Draw the graph of a demand curve for a normal good like pizza. Pick a price (like P_0). Identify the corresponding Q_0. See an example in Figure 3.6b.

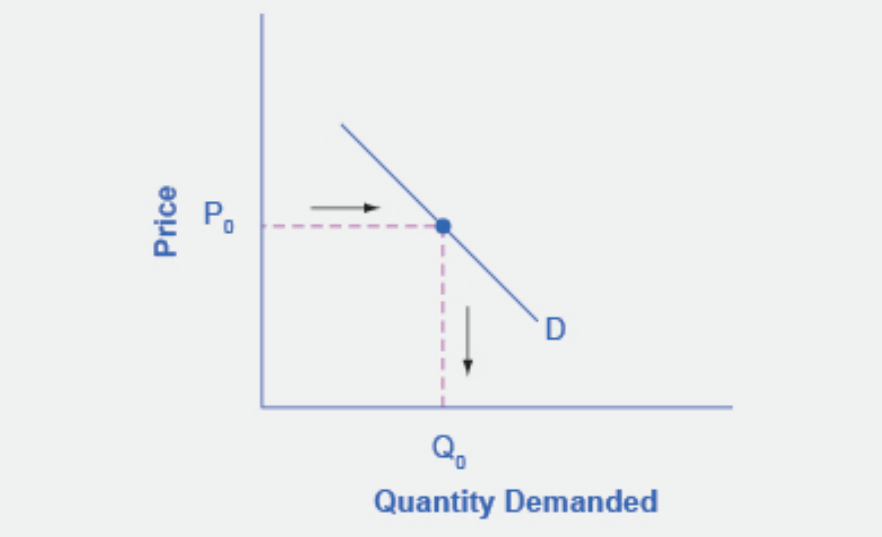

Figure 3.6b Demand Curve. We can use the demand curve to identify how much consumers would buy at any given price. Graph by Steven A. Greenlaw & David Shapiro (OpenStax), licensed under CC BY 4.0.

Figure 3.6b Demand Curve (Text version)

Figure 3.6b Demand Curve represents the directions for step 1. The vertical axis represents Price and the horizontal axis represents Quantity Demand. The point is at (P_0, Q_0) is plotted on the graph an arrow and dotted line denotes Price moving left from the vertical axis to right towards the point (P_0, Q_0) and from that point Quality Demanded is denoted by an arrow and dotted line moving downward towards the horizontal axis forming a square shape. here is a linear demand curve labelled D remains unchanged demand curve slanting downward from left to right through point (P_0, Q_0). Relationship between price and quantity, when price goes down output increases.

Step 2. Suppose income increases. As a result of the change, are consumers going to buy more or less pizza? The answer is more. Draw a dotted horizontal line from the chosen price, through the original quantity demanded, to the new point with the new Q_1. Draw a dotted vertical line down to the horizontal axis and label the new Q_1. Figure 3.6c provides an example.

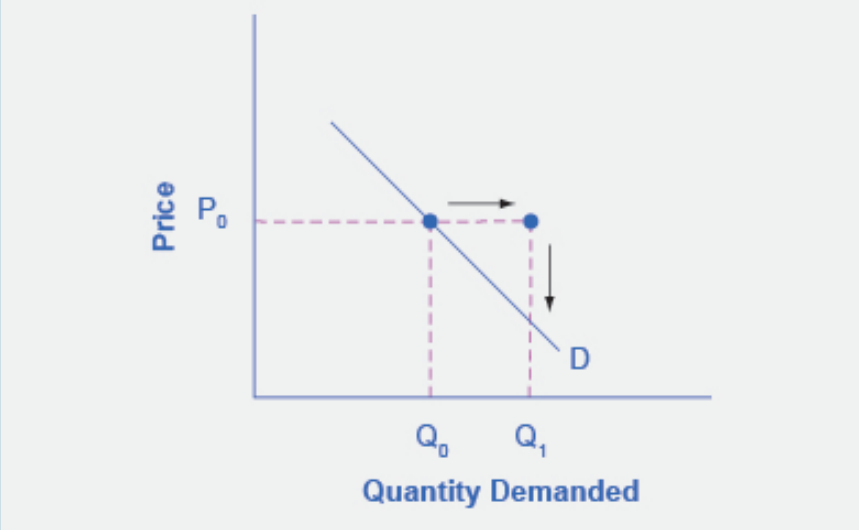

Figure 3.6c Demand Curve with Income Increase. With an increase in income, consumers will purchase larger quantities, pushing demand to the right. Graph by Steven A. Greenlaw & David Shapiro (OpenStax), licensed under CC BY 4.0.

Figure 3.6c Demand Curve with Income Increase (Text version)

Figure 3.6c Demand Curve with Income Increase shows steps 2, based off the original Figure 3.6 Demand Curve. Price increases moving point P_0 to the right and this is denoted by a continuation of the dotted line and an arrow moving left to right. This price increase also shifts Quantity Demanded to the right from Q_0 to Q_1 and is depicted by an arrow pointing from the new point (P_0, Q_1) to the horizontal axis. There is a linear demand curve labelled D remains unchanged – slanting downward from left to right through point (P_0, Q_0), – this will be changed in the following graph**.**

Step 3. Now, shift the curve through the new point. You will see that an increase in income causes an upward (or rightward) shift in the demand curve, so that at any price the quantities demanded will be higher, as Figure 3.6d illustrates.

Figure 3.6d Demand Curve Shifted Right. With an increase in income, consumers will purchase larger quantities, pushing demand to the right, and causing the demand curve to shift right. Graph by Steven A. Greenlaw & David Shapiro (OpenStax), licensed under CC BY 4.0.

Figure 3.6d Demand Curve Shifted Right (Text version)

Figure 3.6d Demand Curve Shifted Right represents the directions for step 3. The graph is based off Figure 3.6c Demand Curve with Income Increase but reflects the the rightward shift of the demand curve. The demand curve retains it's linear downward slope from left to right, but shifts from D_0 to D_1 to intersect the new point (P_1, Q_1).

Summing Up Factors That Change Demand

Figure 3.6e summarizes six factors that can shift demand curves. The direction of the arrows indicates whether the demand curve shifts represent an increase in demand or a decrease in demand. Notice that a change in the price of the good or service itself is not listed among the factors that can shift a demand curve. A change in the price of a good or service causes a movement along a specific demand curve, and it typically leads to some change in the quantity demanded, but it does not shift the demand curve.

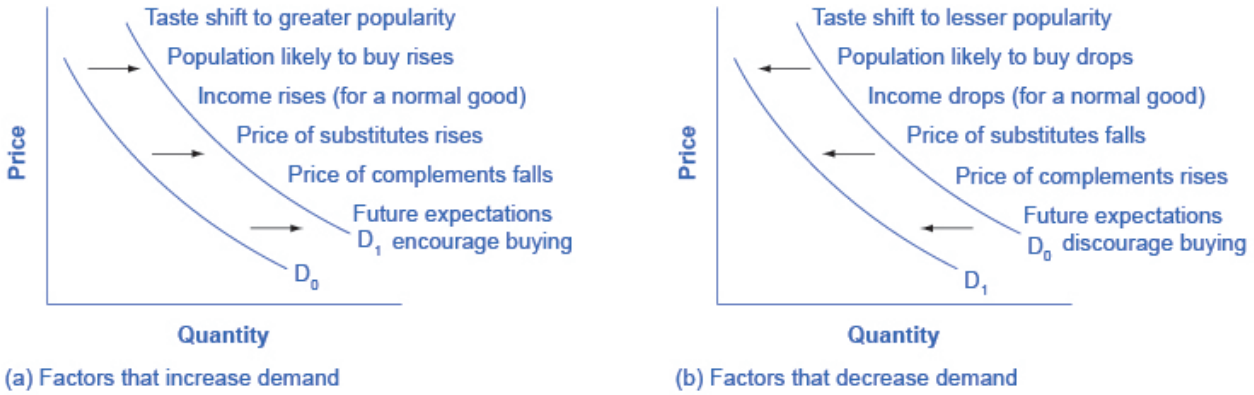

Figure 3.6e Factors That Shift Demand Curves. Graph A: list of factors that can cause an increase in demand from D0 to D1. Graph B: Lists the same factors, if their direction is reversed, can cause a decrease in demand from D0 to D1. Graph by Steven A. Greenlaw & David Shapiro (OpenStax), licensed under CC BY 4.0.

Figure 3.6e Factors That Shift Demand Curves (Text version)

Figure 3.6e Factors That Shift Demand Curves depicts two graphs, Graph A and B. Both graphs have the same vertical and horizontal axes: Price is the vertical axis and Quantity is the horizontal axis. There are two demand curves denoted by D_0 to D_1 and they both run parallel to each other in concave lines that curves downward from left to right. Graph A on the left lists events that could lead to increased demand. Graph B on the right lists events that could lead to decreased demand.

In Graph A: Factors that increase demand shift the demand curve from D_0 to D_1 up and to the right. The factors are: tastes shift to greater popularity, population likely to buy rises, income rises (from a normal good), price of substitutes rises, price of complements falls, future expectations encourage buying.

In Graph B: Factors that decrease demand shifts the demand curve from D_0 to D_1 down and to the left. The factors are: tastes shift to lesser popularity, population likley to buy drops, income drops (from a normal good), price of substitues falls, price of complements rises, future expectations discourage buying.

When a demand curve shifts, it will then intersect with a given supply curve at a different equilibrium price and quantity. We are, however, getting ahead of our story. Before discussing how changes in demand can affect equilibrium price and quantity, we first need to discuss shifts in supply curves.

How Production Costs Affect Supply

A supply curve shows how quantity supplied will change as the price rises and falls, assuming *ceteris paribus* so that no other economically relevant factors are changing. If other factors relevant to supply do change, then

the entire supply curve will shift. Just as we described a shift in demand as a change in the quantity demanded at every price, a **shift in supply** means a change in the quantity supplied at every price.

In thinking about the factors that affect supply, remember what motivates firms: profits, which are the difference between revenues and costs. A firm produces goods and services using combinations of labour, materials, and machinery, or what we call inputs or **factors of production**. If a firm faces lower costs of production, while the prices for the good or service the firm produces remain unchanged, a firm's profits go up. When a firm's profits increase, it is more motivated to produce output, since the more it produces the more profit it will earn. When costs of production fall, a firm will tend to supply a larger quantity at any given price for its output. We can show this by the supply curve shifting to the right.

Take, for example, a messenger company that delivers packages around a city. The company may find that buying gasoline is one of its main costs. If the price of gasoline falls, then the company will find it can deliver messages more cheaply than before. Since lower costs correspond to higher profits, the messenger company may now supply more of its services at any given price. For example, given the lower gasoline prices, the company can now serve a greater area, and increase its supply.

Conversely, if a firm faces higher costs of production, then it will earn lower profits at any given selling price for its products. As a result, a higher cost of production typically causes a firm to supply a smaller quantity at any given price. In this case, the supply curve shifts to the left.

Consider the supply for cars, shown by curve S_0 in Figure 3.6f. Point J indicates that if the price is $20,000, the quantity supplied will be 18 million cars. If the price rises to $22,000 per car, *ceteris paribus,* the quantity supplied will rise to 20 million cars, as point K on the S_0 curve shows. We can show the same information in table form, as in Table 3.6b.

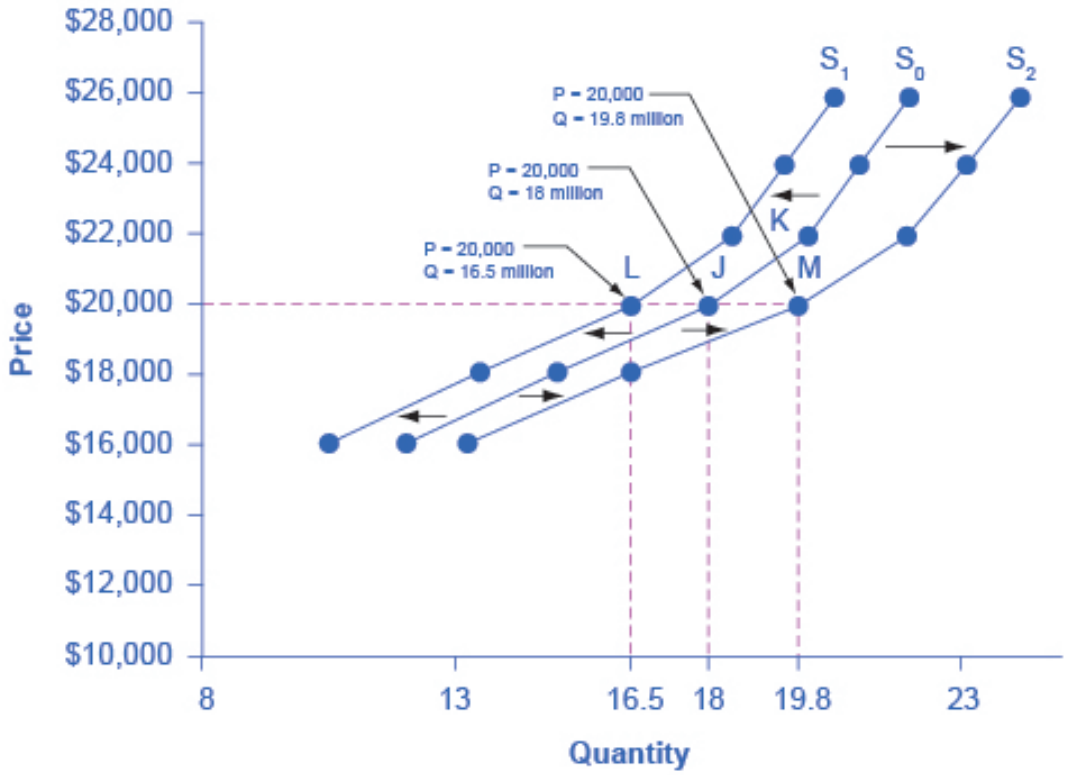

Figure 3.6f Shifts in Supply: A Car Example. Decreased supply means that at every given price, the quantity supplied is lower, so that the supply curve shifts to the left, from S_0 to S_1. Increased supply means that at every given price, the quantity supplied is higher, so that the supply curve shifts to the right, from S_0 to S_1. Graph by Steven A. Greenlaw & David Shapiro (OpenStax), licensed under CC BY 4.0.

Figure 3.6f Shifts in Supply: A Car Example (Text version)

The graphs vertical axis is Price ($) in thousands and the horizontal axis is Quantity in millions. All 3 supply curves slope gradually upwards from left to right. Uses the base price 20,000 to plot points L, J, and M.

The original supply curve supply curve (S_0) is the intersects point J, with a price of $ 20,000, and quantity 18 million.Supply curve S_1 represents a shift based on decreased supply, shifting from S_0 to the left and intersects point L, $ 20,000, and quantity 16.5 million. Supply curve S_2 represents a shift based on increased supply and moves from S_0 to the right to S_2 and intersects point M, $ 20,000, and quantity 19.8 million. (20,000, 19.8). See the table below for data reflected in the graph.

Table 3.6b Price and Shifts in Supply: A Car Example

Price	Decrease to S_1	Original Quantity Supplied S_0	Increase to S_2
$16,000	10.5 million	12.0 million	13.2 million
$18,000	13.5 million	15.0 million	16.5 million
$20,000	16.5 million	18.0 million	19.8 million
$22,000	18.5 million	20.0 million	22.0 million
$24,000	19.5 million	21.0 million	23.1 million
$26,000	20.5 million	22.0 million	24.2 million

Now, imagine that the price of steel, an important ingredient in manufacturing cars, rises, so that producing a car has become more expensive. At any given price for selling cars, car manufacturers will react by supplying a lower quantity. We can show this graphically as a leftward shift of supply, from S_0 to S_1, which indicates that at any given price, the quantity supplied decreases. In this example, at a price of $20,000, the quantity supplied decreases from 18 million on the original supply curve (S_0) to 16.5 million on the supply curve S_1, which is labeled as point L.

Conversely, if the price of steel decreases, producing a car becomes less expensive. At any given price for selling cars, car manufacturers can now expect to earn higher profits, so they will supply a higher quantity. The shift of supply to the right, from S_0 to S_2, means that at all prices, the quantity supplied has increased. In this example, at a price of $20,000, the quantity supplied increases from 18 million on the original supply curve (S_0) to 19.8 million on the supply curve S_2, which is labeled M.

Other Factors That Affect Supply

In the example above, we saw that changes in the prices of inputs in the production process will affect the cost of production and thus the supply. Several other things affect the cost of production, too, such as changes in weather or other natural conditions, new technologies for production, and some government policies.

Changes in weather and climate will affect the cost of production for many agricultural products. For example, in 2014 the Manchurian Plain in Northeastern China, which produces most of the country's wheat, corn, and soybeans, experienced its most severe drought in 50 years. A drought decreases the supply of agricultural products, which means that at any given price, a lower quantity will be supplied. Conversely, especially good weather would shift the supply curve to the right.

When a firm discovers a new technology that allows the firm to produce at a lower cost, the supply curve will shift to the right, as well. For instance, in the 1960s a major scientific effort nicknamed the Green Revolution

focused on breeding improved seeds for basic crops like wheat and rice. By the early 1990s, more than two-thirds of the wheat and rice in low-income countries around the world used these Green Revolution seeds—and the harvest was twice as high per acre. A technological improvement that reduces costs of production will shift supply to the right, so that a greater quantity will be produced at any given price.

Government policies can affect the cost of production and the supply curve through taxes, regulations, and subsidies. For example, the U.S. government imposes a tax on alcoholic beverages that collects about $8 billion per year from producers. Businesses treat taxes as costs. Higher costs decrease supply for the reasons we discussed above. Other examples of policy that can affect cost are the wide array of government regulations that require firms to spend money to provide a cleaner environment or a safer workplace. Complying with regulations increases costs.

A government subsidy, on the other hand, is the opposite of a tax. A subsidy occurs when the government pays a firm directly or reduces the firm's taxes if the firm carries out certain actions. From the firm's perspective, taxes or regulations are an additional cost of production that shifts supply to the left, leading the firm to produce a lower quantity at every given price. Government subsidies reduce the cost of production and increase supply at every given price, shifting supply to the right. The following Work It Out feature shows how this shift happens.

Work It Out: Shift in Supply

We know that a supply curve shows the minimum price a firm will accept to produce a given quantity of output. What happens to the supply curve when the cost of production goes up? Following is an example of a shift in supply due to a production cost increase. The vertical axis is Price and the horizontal axis is Quantity Supplied. The supply curve (S) is linear sloping upwards from left to right.

Step 1. Draw a graph of a supply curve for pizza. Pick a quantity (like Q_0). If you draw a vertical line up from Q_0 to the supply curve, you will see the price the firm chooses (P_0) . Figure 3.6g provides an example.

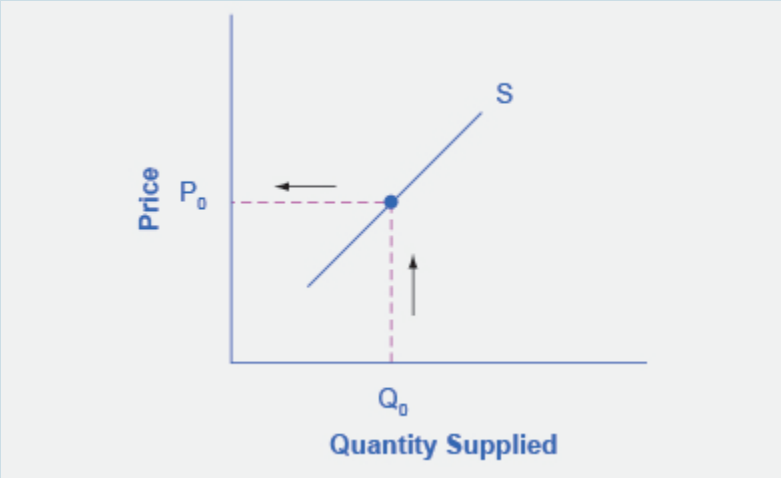

Figure 3.6g Supply Curve. You can use a supply curve to show the minimum price a firm will accept to produce a given quantity of output. Graph by Steven A. Greenlaw & David Shapiro (OpenStax), licensed under CC BY 4.0.

Step 2. Why did the firm choose that price and not some other? One way to think about this is that the price is composed of two parts. The first part is the cost of producing pizzas at the margin; in this case, the cost of producing the pizza, including cost of ingredients (e.g., dough, sauce, cheese, and pepperoni), the cost of the pizza oven, the shop rent, and the workers' wages. The second part is the firm's desired profit, which is determined, among other factors, by the profit margins in that particular business. (Desired profit is not necessarily the same as economic profit.) If you add these two parts together, you get the price the firm wishes to charge. The quantity Q_0 and associated price P_0 give you one point on the firm's supply curve, as Figure 3.6h illustrates.

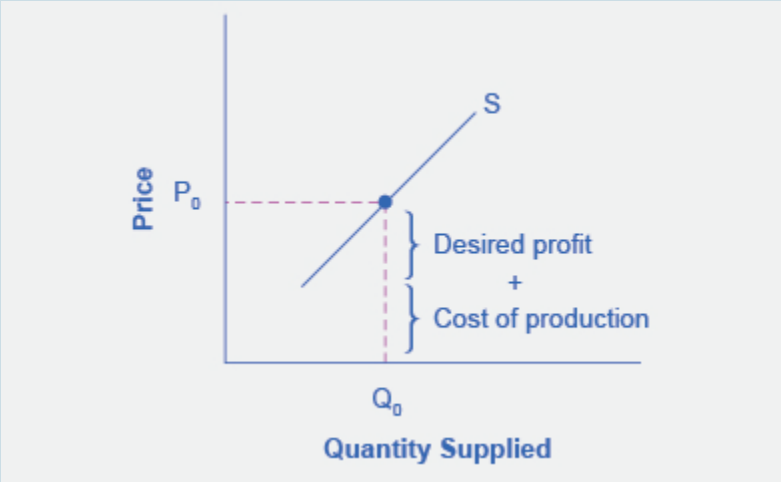

Figure 3.6h Setting Prices. Graph represents the directions for step 2. For a given quantity of output (Q_0), the firm wishes to charge a price (P_0) equal to the cost of production plus the desired profit margin. Setting Prices The cost of production and the desired profit equal the price a firm will set for a product. The supply curve intersects the point (Q_0, P_0). Graph by Steven A. Greenlaw & David Shapiro (OpenStax), licensed under CC BY 4.0.

Step 3. Now, suppose that the cost of production increases. Perhaps cheese has become more expensive by $0.75 per pizza. If that is true, the firm will want to raise its price by the amount of the increase in cost ($0.75). Draw this point on the supply curve directly above the initial point on the curve, but $0.75 higher, as Figure 3.6i shows.

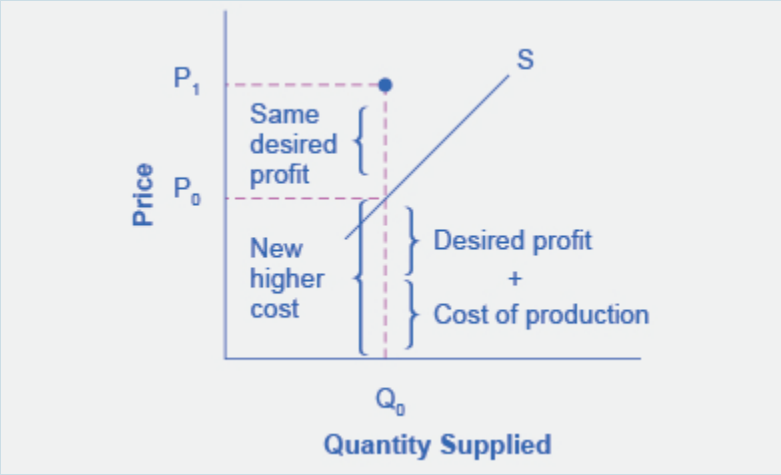

Figure 3.6i Increasing Costs Leads to Increasing Price. Graph by Steven A. Greenlaw & David Shapiro (OpenStax), licensed under CC BY 4.0.

The graph depicts the quantity supplied (Q_0) remaining the same. The original price at P_0 is the new higher cost is equal to the desired profit plus the cost of production. An increasing costs leads to increasing price because the cost of production and the desired profit equal the price a firm will set for a product, if the cost of production increases, the price for the product will also need to increase. Because the cost of production and the desired profit equal the price a firm will set for a product, if the cost of production increases, the price for the product will also need to increase. If the firm would like the same desired profit the price will increase straight upward to P_1.

Step 4. Shift the supply curve through this point. You will see that an increase in cost causes an upward (or a leftward) shift of the supply curve so that at any price, the quantities supplied will be smaller, as Figure 3.6j illustrates.

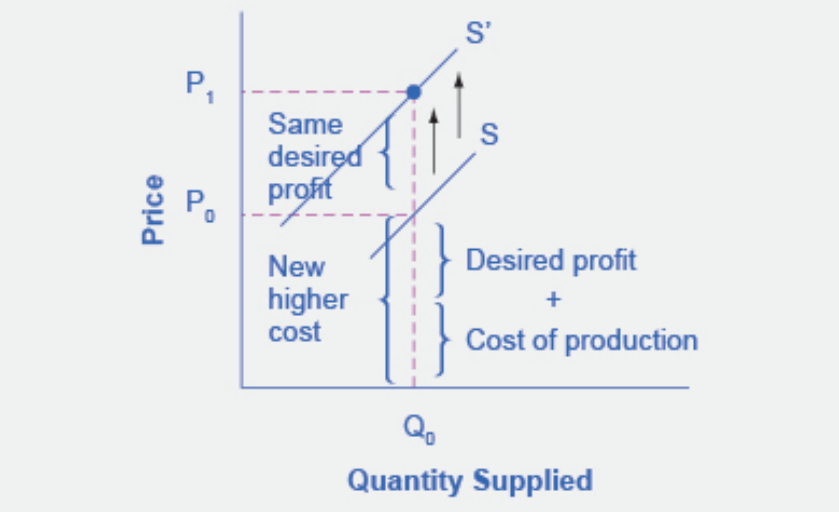

Figure 3.6j Supply Curve Shifts. Supply curve shifts when the cost of production increases, the supply curve shifts upwardly to a new price level. The supply curve has shifted upward from S to S_1 reflecting the change in price from P_0 to P_1. S_1 now intersects the point (Q_0, P_1). Graph by Steven A. Greenlaw & David Shapiro (OpenStax), licensed under CC BY 4.0.

Figure 3.6j supply curve shifts when the cost of production increases, the supply curve shifts upwardly to a new price level. The supply curve has shifted upward from S to S_1 reflecting the change in price from P_0 to P_1. S_1 now intersects the point (Q_0, P_1).

Summing Up Factors That Change Supply

Changes in the cost of inputs, natural disasters, new technologies, and the impact of government decisions all

affect the cost of production. In turn, these factors affect how much firms are willing to supply at any given price.

Figure 3.6k summarizes factors that change the supply of goods and services. Notice that a change in the price of the product itself is not among the factors that shift the supply curve. Although a change in price of a good or service typically causes a change in quantity supplied or a movement along the supply curve for that specific good or service, it does not cause the supply curve itself to shift.

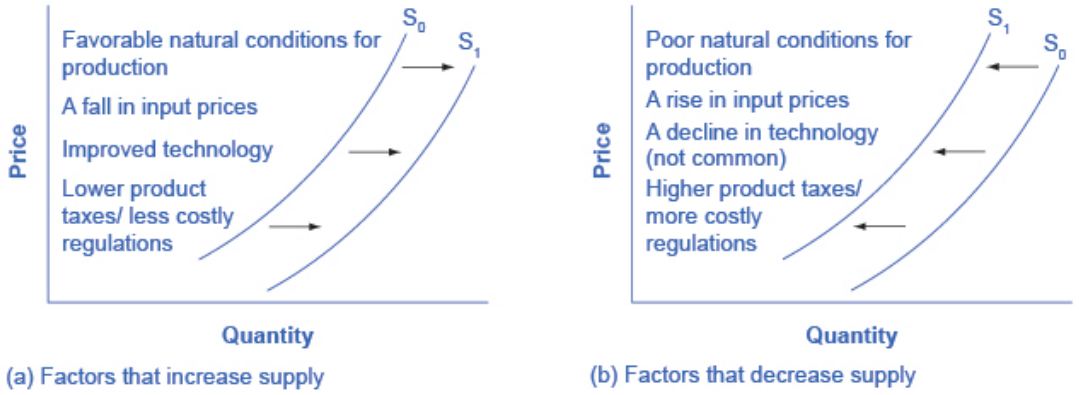

Figure 3.6kFactors That Shift Supply Curves. Graph A lists factors that can cause an increase in supply from S0 to S1. Graph B lists the same factors, and if their direction is reversed, can cause a decrease in supply from S0 to S1. Graph by Steven A. Greenlaw & David Shapiro (OpenStax), licensed under CC BY 4.0.

Figure 3.6k Factors That Shift Supply Curves (Text Version)

Figure 3.6k contains two graphs and both have the same axes: The vertical axis is Price and the horizontal axis is Quantity for both graphs and S_0 is the original supply curve and is the S_1 .Graph A on the left list of factors that can cause an increase in supply shifting S_0 to the right to S_1. The factors that increase supply are:

- Favourable natural conditions for production
- A fall in input prices
- Improved technology
- Lower product taxes/less costly regulations.

Graph B on the right lists the same factors, if their direction is reversed, can cause a decrease in supply shifting S_0 to the left to S_1. The factors that decrease supply are:

- Poor natural conditions for production
- A rise in input prices
- A decline in technology (not common)
- Higher product taxes/more costly regulations.

Because demand and supply curves appear on a two-dimensional diagram with only price and quantity on the axes, an unwary visitor to the land of economics might be fooled into believing that economics is about only four topics: demand, supply, price, and quantity. However, demand and supply are really "umbrella" concepts: demand covers all the factors that affect demand, and supply covers all the factors that affect supply. We include factors other than price that affect demand and supply are included by using shifts in the demand or the supply curve. In this way, the two-dimensional demand and supply model becomes a powerful tool for analyzing a wide range of economic circumstances.

Key Concepts and Summary

Economists often use the *ceteris paribus* or "other things being equal" assumption: while examining the economic impact of one event, all other factors remain unchanged for analysis purposes. Factors that can shift the demand curve for goods and services, causing a different quantity to be demanded at any given price, include changes in tastes, population, income, prices of substitute or complement goods, and expectations about future conditions and prices. Factors that can shift the supply curve for goods and services, causing a different quantity to be supplied at any given price, include input prices, natural conditions, changes in technology, and government taxes, regulations, or subsidies.

Attribution

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3.7 - CHANGES IN EQUILIBRIUM PRICE AND QUANTITY: THE FOUR-STEP PROCESS

Learning Objectives

- Identify equilibrium price and quantity through the four-step process
- Graph equilibrium price and quantity
- Contrast shifts of demand or supply and movements along a demand or supply curve
- Graph demand and supply curves, including equilibrium price and quantity, based on real-world examples

Let's begin this discussion with a single economic event. It might be an event that affects demand, like a change in income, population, tastes, prices of substitutes or complements, or expectations about future prices. It might be an event that affects supply, like a change in natural conditions, input prices, or technology, or government policies that affect production. How does this economic event affect equilibrium price and quantity? We will analyze this question using a four-step process.

Step 1. Draw a demand and supply model before the economic change took place. To establish the model requires four standard pieces of information: The law of demand, which tells us the slope of the demand curve; the law of supply, which gives us the slope of the supply curve; the shift variables for demand; and the shift variables for supply. From this model, find the initial equilibrium values for price and quantity.

Step 2. Decide whether the economic change you are analyzing affects demand or supply. In other words, does the event refer to something in the list of demand factors or supply factors?

Step 3. Decide whether the effect on demand or supply causes the curve to shift to the right or to the left, and sketch the new demand or supply curve on the diagram. In other words, does the event increase or decrease the amount consumers want to buy or producers want to sell?

Step 4. Identify the new equilibrium and then compare the original equilibrium price and quantity to the new equilibrium price and quantity.

Let's consider one example that involves a shift in supply and one that involves a shift in demand. Then we will consider an example where both supply and demand shift.

Good Weather for Salmon Fishing

Supposed that during the summer of 2015, weather conditions were excellent for commercial salmon fishing off the California coast. Heavy rains meant higher than normal levels of water in the rivers, which helps the salmon to breed. Slightly cooler ocean temperatures stimulated the growth of plankton, the microscopic organisms at the bottom of the ocean food chain, providing everything in the ocean with a hearty food supply. The ocean stayed calm during fishing season, so commercial fishing operations did not lose many days to bad weather. How did these climate conditions affect the quantity and price of salmon? Figure 3.7a illustrates the four-step approach, which we explain below, to work through this problem. Table 3.7a also provides the information to work the problem.

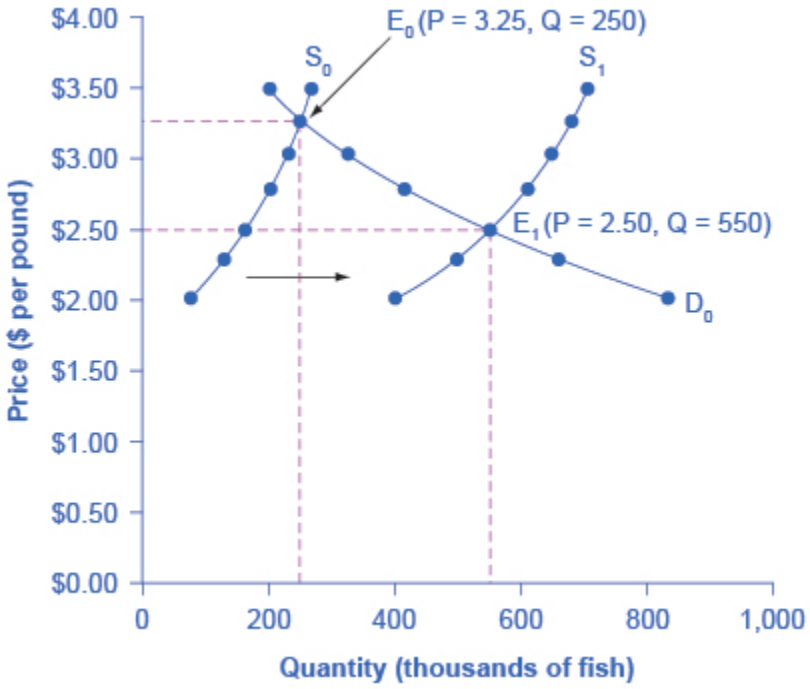

Figure 3.7a Good Weather for Salmon Fishing: The Four-Step Process. The graph represents the four-step approach to determining shifts in the new equilibrium price and quantity in response to good weather for salmon fishing. Figure by Steven A. Greenlaw & David Shapiro (OpenStax), licensed under CC BY 4.0.

Figure 3.7a Good Weather for Salmon Fishing: The Four-Step Process (Text Version)

The graph represents the four-step approach to determining shifts in the new equilibrium price and quantity in response to good weather for salmon fishing.
The vertical axis is Price ($ Per Pound) ranging from $0 to $4 increasing by $0.50 increments and the horizontal axis is Quantity (thousands of fish) increasing by increments of 200.
The original supply curve (S_0) is slightly bowed curve sloping upwards from left to right. The new supply curve (S_1) shifts to the right and is a convex curve sloping upwards from left to right.
Point E_0 occurs along S_0 at ($3.25 per pound, 250 thousand fish) and E1 occurs along the S_1 at ($2.50 per pound, 550 thousand fish). The demand curve (D_0) slopes downward left to right intersecting both E_0 and E_1.
The original supply curve uses data points from Quantity Supplied in 2014, the new supply curve uses data points from Quantity Supplied in 2015, and the demand curve (D_0) uses data points from Quantity demand.

Table 3.7a Salmon Fishing

Price per Pound ($)	Quantity Supplied in 2014	Quantity Supplied in 2015	Quantity Demanded
2.00	80	400	840
2.25	120	480	680
2.50	160	550	550
2.75	200	600	450
3.00	230	640	350
3.25	250	670	250
3.50	270	700	200

Step 1. Draw a demand and supply model to illustrate the market for salmon in the year before the good weather conditions began. The demand curve D_0 and the supply curve S_0 show that the original equilibrium price is $3.25 per pound and the original equilibrium quantity is 250,000 fish. (This price per pound is what commercial buyers pay at the fishing docks. What consumers pay at the grocery is higher.)

Step 2. Did the economic event affect supply or demand? Good weather is an example of a natural condition that affects supply.

Step 3. Was the effect on supply an increase or a decrease? Good weather is a change in natural conditions that increases the quantity supplied at any given price. The supply curve shifts to the right, moving from the original supply curve S_0 to the new supply curve S_1, which Figure 3.7a and Table 3.7a show.

Step 4. Compare the new equilibrium price and quantity to the original equilibrium. At the new equilibrium E_1, the equilibrium price falls from $3.25 to $2.50, but the equilibrium quantity increases from 250,000 to 550,000 salmon. Notice that the equilibrium quantity demanded increased, even though the demand curve did not move.

In short, good weather conditions increased supply of the California commercial salmon. The result was a higher equilibrium quantity of salmon bought and sold in the market at a lower price.

Newspapers and the Internet

According to the Pew Research Center for People and the Press, increasingly more people, especially younger people, are obtaining their news from online and digital sources. The majority of U.S. adults now own smartphones or tablets, and most of those Americans say they use them in part to access the news. From 2004 to 2012, the share of Americans who reported obtaining their news from digital sources increased from 24% to 39%. How has this affected consumption of print news media, and radio and television news? Figure 3.7b and the text below illustrates using the four-step analysis to answer this question.

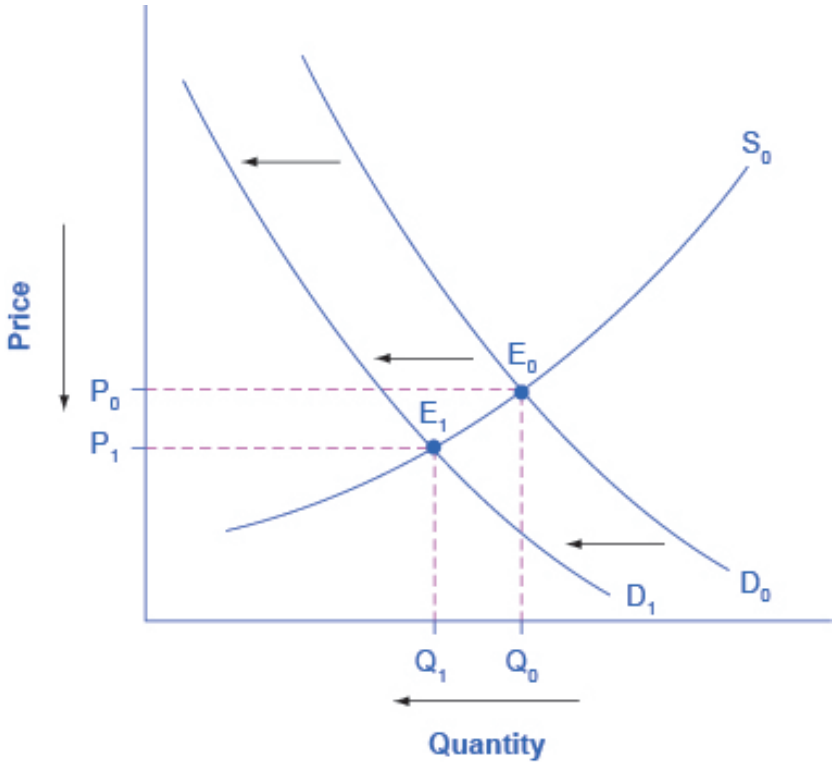

Figure 3.7b The Print News Market: A Four-Step Analysis.
Figure by Steven A. Greenlaw & David Shapiro (OpenStax), licensed under CC BY 4.0.

Figure 3.7b The Print News Market: A Four-Step Analysis (Text Version)

The vertical axis is Price and has a downward facing arrow next to it showing an increase in price. The horizontal axis is Quantity and it has an arrow facing left to show a decrease in quantity. The supply curve (S_0) is concave and slopes upward left to right. The original demand curve (D_0) is concave and slopes upward from right to left and intersects the centre of S_0 at Point E_0 (Q_0, P_0). Arrows pointing from right to left between D_0 and D_2 show the shift in demand curve. The original demand curve (D_0) shifts to the left to the new demand curve (D_1). D_1 now intersects with S_0 at E_2 at point (Q_2, P_2) with P0 shifting downward to P_2 and Q_0 shifting to the left from Q_0 to Q_2.
Figure 3.17 depicts the approach to determining changes in equilibrium price and quantity of print news. The graph shows a change in tastes from print news sources to digital sources results in a leftward shift in demand for the former. The result is a decrease in both equilibrium price and quantity.

Step 1. Develop a demand and supply model to think about what the market looked like before the event. Price is on the vertical axis and quantity is on the horizontal axis. The original quanity is Q_0 and the original price is P_0. The demand curve D_0 and the supply curve S_0 shows the original relationships. In this case, we perform the analysis without specific numbers on the price and quantity axis. The supply curve S_0 is concave trending upward from left to right. The demand curve D_0 is concave trending downward from left to right and intersects with the supply curve at E_0 equilibrium price occuring at (Q_0, P_0).

Step 2. Did the described change affect supply or demand? A change in tastes, from traditional news sources (print, radio, and television) to digital sources, caused a change in demand for the former.

Step 3. Was the effect on demand positive or negative? A shift to digital news sources will tend to mean a lower quantity demanded of traditional news sources at every given price, causing the demand curve for print and other traditional news sources to shift to the left, from D_0 to D_1. The supply curve S_0 remains the same. Quanity is lower, shifting left to Q_1, and price is also lower shifting downward to P_1 and is at the point where the new demand curve D_1 instersects with supply curve S_0 equilibrium price is now E_1.

Step 4. Compare the new equilibrium price and quantity (E_1) to the original equilibrium price (E_0). The new equilibrium (E_1) occurs at a lower quantity and a lower price than the original equilibrium (E_0).

The decline in print news reading predates 2004. Print newspaper circulation peaked in 1973 and has declined since then due to competition from television and radio news. In 1991, 55% of Americans indicated they received their news from print sources, while only 29% did so in 2012. Radio news has followed a similar path in recent decades, with the share of Americans obtaining their news from radio declining from 54% in 1991 to 33% in 2012. Television news has held its own over the last 15 years, with a market share staying in the mid to upper fifties. What does this suggest for the future, given that two-thirds of Americans under 30 years old say they do not obtain their news from television at all?

The Interconnections and Speed of Adjustment in Real Markets

In the real world, many factors that affect demand and supply can change all at once. For example, the demand for cars might increase because of rising incomes and population, and it might decrease because of rising gasoline prices (a complementary good). Likewise, the supply of cars might increase because of innovative new technologies that reduce the cost of car production, and it might decrease as a result of new government regulations requiring the installation of costly pollution-control technology.

Moreover, rising incomes and population or changes in gasoline prices will affect many markets, not just cars. How can an economist sort out all these interconnected events? The answer lies in the *ceteris paribus* assumption. Look at how each economic event affects each market, one event at a time, holding all else constant. Then combine the analyses to see the net effect.

A Combined Example

The U.S. Postal Service is facing difficult challenges. Compensation for postal workers tends to increase most years due to cost-of-living increases. At the same time, increasingly more people are using email, text, and other digital message forms such as Facebook and Twitter to communicate with friends and others. What does this suggest about the continued viability of the Postal Service? Figure 3.7c and the text below illustrate this using the four-step analysis to answer this question.

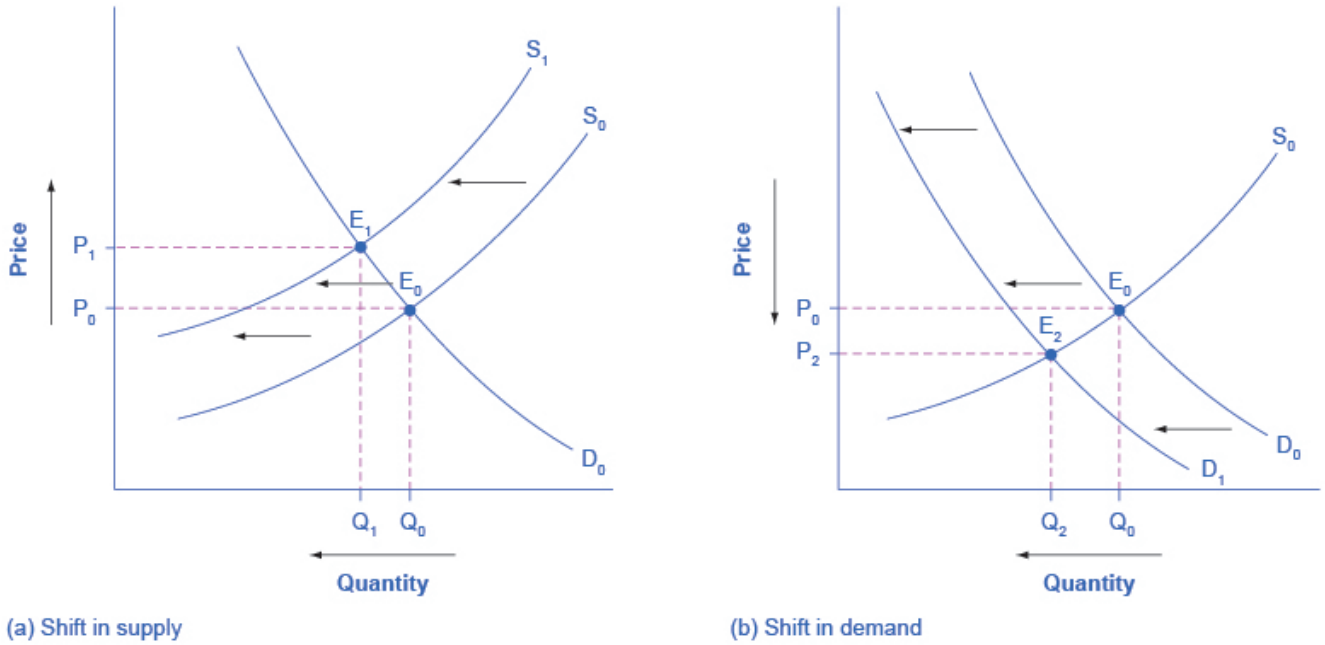

Figure 3.7c Higher Compensation for Postal Workers: A Four-Step Analysis. Figure by Steven A. Greenlaw & David Shapiro (OpenStax), licensed under CC BY 4.0.

Figure 3.7c Higher Compensation for Postal Workers: A Four-Step Analysis (Text Version)

There are two graphs: Graph A depicts the shift in supply and Graph B depicts the shift in demand.
Graph A: The vertical axis is Price and has an upward facing arrow next to it showing an increase in price. The horizontal axis is Quantity and it has an arrow facing left to show a decrease in quantity. The original supply curve (S_0) is concave and slopes upward left to right. Point E_0 (Q_0, P_0) occurs along S_0. The new supply curve (S_1) shifts to the left running parallel toS_0. Occurring along S_1, Point E_1 occurs at (Q_1, P_1) quantity has shifted left from Q_0 to Q_1 and P_0. Arrows pointing from right to left between S_0 and S_1 show the shift in supply curve. The demand curve (D_0) is concave and slopes upward from right to left and intersects the centre of both supply curves S_0 and S_1.
Graph B: The vertical axis is Price and has a downward facing arrow next to it showing an decrease in price. The horizontal axis is Quantity and it has an arrow facing left to show a decrease in quantity. The supply curve (S_0) is concave and slopes upward left to right. The original demand curve (D_0) is concave and slopes upward from right to left and intersects the centre of S_0 at Point E_0 (Q_0, P_0). Arrows pointing from right to left between D_0 and D2 show the shift in demand curve. The original demand curve (D_0) shifts to the left to the new demand curve (D_1). D_1 now intersects with S_0 at E_2 at point (Q2, P2) with P_0 shifting downward to P_2 and Q_0 shifting to the left from Q_0 to Q_2.

Figure 3.7c Higher Compensation for Postal Workers: A Four-Step Analysis (a) Higher labour compensation causes a leftward shift in the supply curve, a decrease in the equilibrium quantity, and an increase in the

equilibrium price. (b) A change in tastes away from Postal Services causes a leftward shift in the demand curve, a decrease in the equilibrium quantity, and a decrease in the equilibrium price.

Since this problem involves two disturbances, we need two four-step analyses, the first to analyze the effects of higher compensation for postal workers, the second to analyze the effects of many people switching from "snail mail" to email and other digital messages.

Figure 3.7c (a) shows the shift in supply discussed in the following steps.

Step 1. Draw a demand and supply model to illustrate what the market for the U.S. Postal Service looked like before this scenario starts. The demand curve D_0 and the supply curve S_0 show the original relationships.

Step 2. Did the described change affect supply or demand? Labour compensation is a cost of production. A change in production costs caused a change in supply for the Postal Service.

Step 3. Was the effect on supply positive or negative? Higher labour compensation leads to a lower quantity supplied of postal services at every given price, causing the supply curve for postal services to shift to the left, from S_0 to S_1.

Step 4. Compare the new equilibrium price and quantity to the original equilibrium price. The new equilibrium (E_1) occurs at a lower quantity and a higher price than the original equilibrium (E_0).

Figure 3.7c (b) shows the shift in demand in the following steps.

Step 1. Draw a demand and supply model to illustrate what the market for U.S. Postal Services looked like before this scenario starts. The demand curve D_0 and the supply curve S_0 show the original relationships. Note that this diagram is independent from the diagram in panel (a).

Step 2. Did the change described affect supply or demand? A change in tastes away from snail mail toward digital messages will cause a change in demand for the Postal Service.

Step 3. Was the effect on demand positive or negative? A change in tastes away from snailmail toward digital messages causes lower quantity demanded of postal services at every given price, causing the demand curve for postal services to shift to the left, from D_0 to D_1.

Step 4. Compare the new equilibrium price and quantity to the original equilibrium price. The new equilibrium (E_2) occurs at a lower quantity and a lower price than the original equilibrium (E_0).

The final step in a scenario where both supply and demand shift is to combine the two individual analyses to determine what happens to the equilibrium quantity and price. Graphically, we superimpose the previous two diagrams one on top of the other, as in Figure 3.7d.

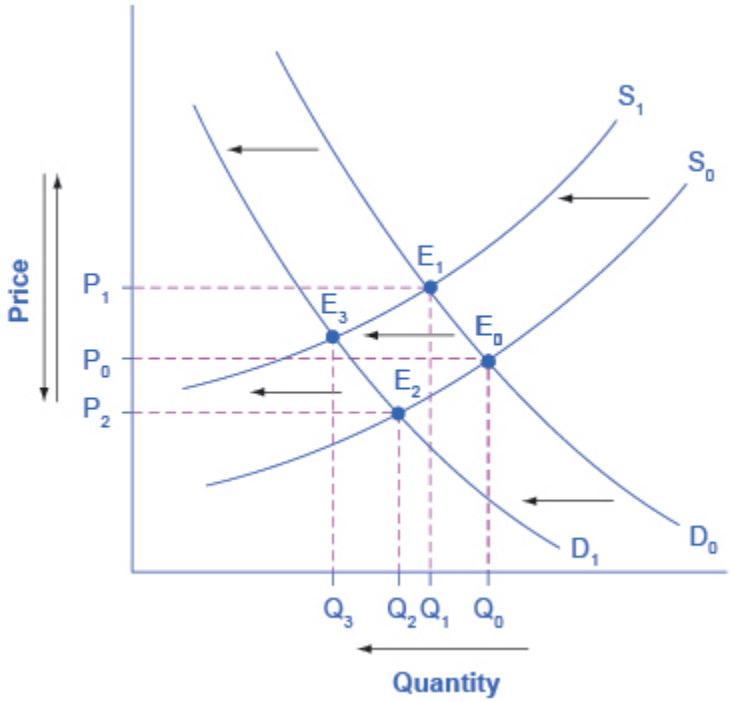

Figure 3.7d Combined Effect of Decreased Demand and Decreased Supply. Figure by Steven A. Greenlaw & David Shapiro (OpenStax), licensed under CC BY 4.0.

Figure 3.7d Combined Effect of Decreased Demand and Decreased Supply (Text Version)

The vertical axis is Price and the horizontal axis is Quantity. The original supply curve (S0) slopes upward from left to right. The original demand curve (D0) slopes downward from left to right.

Where the original supply curve (S0) and original demand curve (D0) intersects is the original equilibrium at point P0 Q0.

Effect on Quantity: The effect of higher labour compensation on Postal Services because it raises the cost of production is to decrease the equilibrium quantity. Both the demand and supply curve shift: D0 shifts to the left to D1 and S0 shifts to the left to S1. The decrease in the equilibrium quantity of Postal Services (Q3) results in a new equilibrium (E3), which occurs where S1 and D1 intersect.

Effect on Price: There are different factors that can affect the price equilibrium:

The effect of higher labour compensation on Postal Services, because it raises the cost of production, is to increase the equilibrium price. Quantity decreases and S0 shifts to the left to Q1; however, D0 remains the same. S1 and D0 intersect at the new equilibrium E1 at P1, Q1.

The effect of a change in tastes away from snail mail is to decrease the equilibrium price. Quantity decreases and D0 shifts to the left to Q2; however, S0 remains the same. D1 and S0 intersect at the new equilibrium E2 at P2, Q2.

Following are the results:

Effect on Quantity: The effect of higher labour compensation on Postal Services because it raises the cost of production is to decrease the equilibrium quantity. The effect of a change in tastes away from snail mail is to decrease the equilibrium quantity. Since both shifts are to the left, the overall impact is a decrease in the equilibrium quantity of Postal Services (Q_3). This is easy to see graphically, since Q_3 is to the left of Q_0.

Effect on Price: The overall effect on price is more complicated. The effect of higher labour compensation on Postal Services, because it raises the cost of production, is to increase the equilibrium price. The effect of a change in tastes away from snail mail is to decrease the equilibrium price. Since the two effects are in opposite directions, unless we know the magnitudes of the two effects, the overall effect is unclear. This is not unusual. When both curves shift, typically we can determine the overall effect on price or on quantity, but not on both. In this case, we determined the overall effect on the equilibrium quantity, but not on the equilibrium price. In other cases, it might be the opposite.

The next Clear It Up feature focuses on the difference between shifts of supply or demand and movements along a curve.

Clear It Up

What is the difference between shifts of demand or supply versus movements along a demand or supply curve?

One common mistake in applying the demand and supply framework is to confuse the shift of a demand or a supply curve with movement along a demand or supply curve. As an example, consider a problem that asks whether a drought will increase or decrease the equilibrium quantity and equilibrium price of wheat. Lee, a student in an introductory economics class, might reason:

"Well, it is clear that a drought reduces supply, so I will shift back the supply curve, as in the shift from the original supply curve S_0 to S_1 on the diagram (Shift 1). The equilibrium moves from E_0 to E_1, the equilibrium quantity is lower and the equilibrium price is higher. Then, a higher price makes farmers more likely to supply the good, so the supply curve shifts right, as shows the shift from S_1 to S_2, shows on the diagram (Shift 2), so that the equilibrium now moves from E_1 to E_2. The higher price, however,

also reduces demand and so causes demand to shift back, like the shift from the original demand curve, D_0 to D_1 on the diagram (labeled Shift 3), and the equilibrium moves from E_2 to E_3."

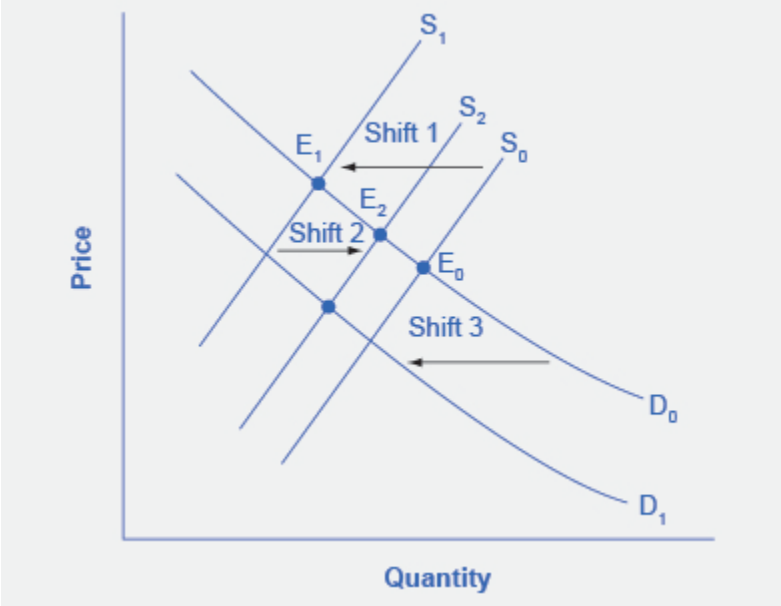

Figure 3.7e Shifts of Demand or Supply versus Movements along a Demand or Supply Curve. A shift in one curve never causes a shift in the other curve. Rather, a shift in one curve causes a movement along the second curve. Figure by Steven A. Greenlaw & David Shapiro (OpenStax), licensed under CC BY 4.0.

Figure 3.7e Shifts of Demand or Supply versus Movements along a Demand or Supply Curve (Text Version)

The vertical axis is Price and the horizontal axis is Quantity. The original supply curve (S_0) is linear sloping upwards from left to right in the middle of the graph. The original demand curve (D_0) is slightly curved sloping downward from left to right and intersects with S_0 at Point E_0, the original equilibrium.

Shift 1: S_0 shifts furthest to the left to S_1; E0 also shifts to the left where S_1 and D_0 intersect, denoted by Point E_1.

Shift 2: S_1 then shifts slightly back to the right becoming S_2; E_1 also shifts to the right to where S_2 and D_0 intersect, denoted by Point E_2.

Shift 3: D_0 shifts to D_1 shifts to the left; E_2 shifts downward to a new point of equilibrium at S_2 and D_1.

At about this point, Lee suspects that this answer is headed down the wrong path. Think about what might be wrong with Lee's logic, and then read the answer that follows.

Answer: Lee's first step is correct: that is, a drought shifts back the supply curve of wheat and leads to

a prediction of a lower equilibrium quantity and a higher equilibrium price. This corresponds to a movement along the original demand curve (D_0), from E_0 to E_1. The rest of Lee's argument is wrong, because it mixes up shifts in supply with quantity supplied, and shifts in demand with quantity demanded. A higher or lower price never shifts the supply curve, as suggested by the shift in supply from S_1 to S_2. Instead, a price change leads to a movement along a given supply curve. Similarly, a higher or lower price never shifts a demand curve, as suggested in the shift from D_0 to D_1. Instead, a price change leads to a movement along a given demand curve. Remember, a change in the price of a good never causes the demand or supply curve for that good to shift.

Think carefully about the timeline of events: What happens first, what happens next? What is cause, what is effect? If you keep the order right, you are more likely to get the analysis correct.

In the four-step analysis of how economic events affect equilibrium price and quantity, the movement from the old to the new equilibrium seems immediate. As a practical matter, however, prices and quantities often do not zoom straight to equilibrium. More realistically, when an economic event causes demand or supply to shift, prices and quantities set off in the general direction of equilibrium. Even as they are moving toward one new equilibrium, a subsequent change in demand or supply often pushes prices toward another equilibrium.

Key Concepts and Summary

When using the supply and demand framework to think about how an event will affect the equilibrium price and quantity, proceed through four steps:

1. sketch a supply and demand diagram to think about what the market looked like before the event
2. decide whether the event will affect supply or demand
3. decide whether the effect on supply or demand is negative or positive, and draw the appropriate shifted supply or demand curve
4. compare the new equilibrium price and quantity to the original ones.

Attribution

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3.8 - DEMAND, SUPPLY, AND EFFICIENCY

Learning Objectives

- Contrast consumer surplus, producer surplus, and social surplus
- Explain why price floors and price ceilings can be inefficient
- Analyze demand and supply as a social adjustment mechanism

The familiar demand and supply diagram holds within it the concept of economic efficiency. One typical way that economists define efficiency is when it is impossible to improve the situation of one party without imposing a cost on another. Conversely, if a situation is inefficient, it becomes possible to benefit at least one party without imposing costs on others.

Efficiency in the demand and supply model has the same basic meaning: The economy is getting as much benefit as possible from its scarce resources and all the possible gains from trade have been achieved. In other words, the optimal amount of each good and service is produced and consumed.

Consumer Surplus, Producer Surplus, Social Surplus

Consider a market for tablet computers, as Figure 3.8a shows. The equilibrium price is $80 and the equilibrium quantity is 28 million. To see the benefits to consumers, look at the segment of the demand curve above the equilibrium point and to the left. This portion of the demand curve shows that at least some demanders would have been willing to pay more than $80 for a tablet.

For example, point J shows that if the price were $90, 20 million tablets would be sold. Those consumers who would have been willing to pay $90 for a tablet based on the utility they expect to receive from it, but who were able to pay the equilibrium price of $80, clearly received a benefit beyond what they had to pay. Remember, the demand curve traces consumers' willingness to pay for different quantities. The amount that

individuals would have been willing to pay, minus the amount that they actually paid, is called **consumer surplus**. Consumer surplus is the area labeled F—that is, the area above the market price and below the demand curve.

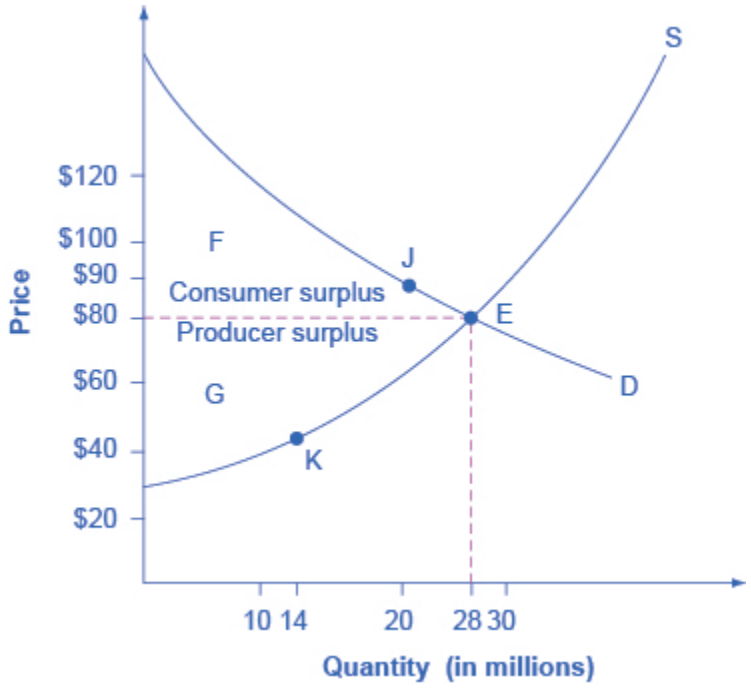

Figure 3.8a Consumer and Producer Surplus. Figure by Steven A. Greenlaw & David Shapiro (OpenStax), licensed under CC BY 4.0.

Figure 3.8a Consumer and Producer Surplus (Text Version)

The vertical axis is Price ($) in $20 increments and the horizontal axis is Quantity (in millions) in increments of 2. Supply curve (S) is curved sloping from left to right. The demand curve (D) is curved and slopes downward left to right. The Supply curve (S) and demand curve (D) intersects at Point E (28 million quantity, $80).
The dotted line running from Point E to the vertical axis price at $80 denotes the space for consumer surplus (F) and Producer surplus (G). Consumer surplus (F) occurs the left of point E above $80 and below the where the demand curve (D) slopes downward. Producer surplus (G) occurs the left of point E below $80 and above the where the supply curve (D) slopes upwards.
Point K (14 million quantity, $45) occurs earlier in the supply curve (S).
Point J (20 million quantity, $90) occurs along the demand curve (D).

Figure 3.23 Consumer and **Producer Surplus** The somewhat triangular area labeled by F shows the area of consumer surplus, which shows that the equilibrium price in the market was less than what many of the consumers were willing to pay. Point J on the demand curve shows that, even at the price of $90, consumers

would have been willing to purchase a quantity of 20 million. The somewhat triangular area labeled by G shows the area of producer surplus, which shows that the equilibrium price received in the market was more than what many of the producers were willing to accept for their products. For example, point K on the supply curve shows that at a price of $45, firms would have been willing to supply a quantity of 14 million.

The supply curve shows the quantity that firms are willing to supply at each price. For example, point K in Figure 3.8a illustrates that, at $45, firms would still have been willing to supply a quantity of 14 million. Those producers who would have been willing to supply the tablets at $45, but who were instead able to charge the equilibrium price of $80, clearly received an extra benefit beyond what they required to supply the product. The extra benefit producers receive from selling a good or service, measured by the price the producer actually received minus the price the producer would have been willing to accept is called producer surplus. In Figure 3.8a, producer surplus is the area labeled G—that is, the area between the market price and the segment of the supply curve below the equilibrium.

The sum of consumer surplus and producer surplus is **social surplus**, also referred to as **economic surplus** or **total surplus**. In Figure 3.8a we show social surplus as the area F + G. Social surplus is larger at equilibrium quantity and price than it would be at any other quantity. This demonstrates the economic efficiency of the market equilibrium. In addition, at the efficient level of output, it is impossible to produce greater consumer surplus without reducing producer surplus, and it is impossible to produce greater producer surplus without reducing consumer surplus.

Inefficiency of Price Floors and Price Ceilings

The imposition of a price floor or a price ceiling will prevent a market from adjusting to its equilibrium price and quantity, and thus will create an inefficient outcome. However, there is an additional twist here. Along with creating inefficiency, price floors and ceilings will also transfer some consumer surplus to producers, or some producer surplus to consumers.

Imagine that several firms develop a promising but expensive new drug for treating back pain. If this therapy is left to the market, the equilibrium price will be $600 per month and 20,000 people will use the drug, as shown in Figure 3.8b (a). The original level of consumer surplus is T + U and producer surplus is V + W + X. However, the government decides to impose a price ceiling of $400 to make the drug more affordable. At this price ceiling, firms in the market now produce only 15,000.

As a result, two changes occur. First, an inefficient outcome occurs and the total surplus of society is reduced. The loss in social surplus that occurs when the economy produces at an inefficient quantity is called **deadweight loss**. In a very real sense, it is like money thrown away that benefits no one. In Figure 3.8b (a), the deadweight loss is the area U + W. When deadweight loss exists, it is possible for both consumer and

producer surplus to be higher, in this case because the price control is blocking some suppliers and demanders from transactions they would both be willing to make.

A second change from the price ceiling is that some of the producer surplus is transferred to consumers. After the price ceiling is imposed, the new consumer surplus is T + V, while the new producer surplus is X. In other words, the price ceiling transfers the area of surplus (V) from producers to consumers. Note that the gain to consumers is less than the loss to producers, which is just another way of seeing the deadweight loss.

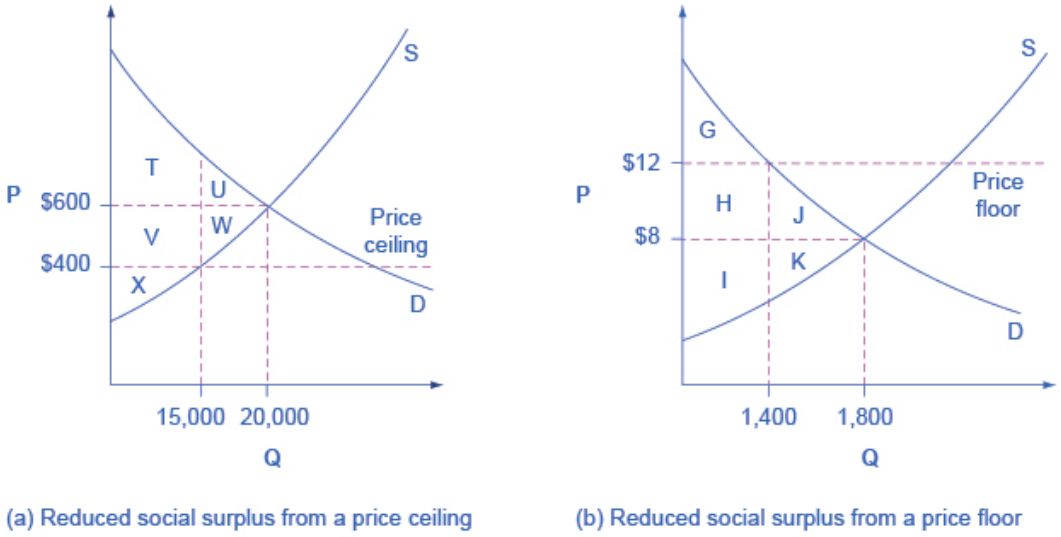

Figure 3.8b Efficiency and Price Floors and Ceilings. Figure by Steven A. Greenlaw & David Shapiro (OpenStax), licensed under CC BY 4.0.

Figure 3.8b Efficiency and Price Floors and Ceilings (Text Version)

Figure 3.8b Efficiency and Price Floors and Ceilings contains 2 graphs: Graph A is the reduced social surplus from a price ceiling, Graph B is the reduced social surplus from a price floor. Both graphs have the vertical axis is Price (P) and the horizontal axis is Quantity (Q).

Graph A is the reduced social surplus from a price ceiling: The supply curve (S) slopes upward from left to right and the demand curve (D) slopes downward right to left. The point where S and D intersect is the original equilibrium price (20,000 quantity, $600). The Price ceiling is at $400 and is denoted by straight horizontal dotted line. A price ceiling is imposed at $400, so firms in the market now produce only a quantity of 15,000.
A horizontal dotted line runs from the original equilibrium price (20,000 quantity, $600) to the vertical axis Price. Vertical and horizontal dotted lines originating from their respective axis indicate the new equilibrium price (15,000 quantity, $400). The vertical dotted line runs upwards from 15,000 quantity and intersects with supply curve (S) at $400 and the and the horizontal dotted line denoting the original equilibrium price at

$600 until it reaches demand curve (D).
U is the section to the left of the original equilibrium(20,000 quantity, $600) between the horizontal dotted line of $600 and the demand curve D, occurring between 15,000 and 20,000 quantity. To the left of section U is section T which is the remaining space between the horizontal dotted line of $600 and the demand curve (D) and between 0 to 15,000 quantity.
W is the section to the left of the original equilibrium between the horizontal dotted line of $600 and the Supply curve (S), occurring between 15,000 and 20,000 quantity. To the left of section W is section V which is the remaining space between the horizontal dotted line of $600 and dotted line $400 (price ceiling) and between 0 to 15,000 quantity. The X section is below section W and is the remaining space between the horizontal dotted line $400 (price ceiling) and the supply curve (S) between 0 to 15,000 quantity.
Graph B is the reduced social surplus from a price floor: The supply curve (S) slopes upward from left to right and the demand curve (D) slopes downward right to left. The point where S and D intersect is the original equilibrium price (1,800 quantity, $8). The Price floor is at $12 and is denoted by straight horizontal dotted line. A price floor is imposed at $12, which means that quantity demanded falls to 1,400: the new equilibrium is at (1,400 quantity, $12).
A horizontal dotted line runs from the original equilibrium price (1,800 quantity, $8) to the vertical axis Price. Vertical and horizontal dotted lines originating from their respective axis indicate the new equilibrium price (1,400 quantity, $12). The vertical dotted line runs upwards from 1,400 quantity and intersects with supply curve (S) and continues through the horizontal dotted line denoting the original equilibrium price at $8 until it reaches demand curve (D) at the price floor ($12).
J is the section to the left of the original equilibrium (1,800 quantity, $8) between the horizontal dotted line of $8 and the demand curve (D), occurring between 1,800 and 1,400 quantity. To the left of section J is section H which is the remaining space between the horizontal dotted line of $8 and dotted line $12 (price floor) and between 0 to 1,400 quantity. Above Section H is section G which is the remaining space between the price floor ($12) and the demand curve (D) between 0 and 1,400 quantity.
K is the section to the left of the original equilibrium between the horizontal dotted line of $8 and the Supply curve (S), occurring between 1,800 and 1,400 quantity. To the left of section K is section I which is the remaining space between the horizontal dotted line of $8 and the supply curve (S) from 0 and 1,400 quantity.

Figure 3.8b Efficiency and Price Floors and Ceilings (a) The original equilibrium price is $600 with a quantity of 20,000. Consumer surplus is T + U, and producer surplus is V + W + X. A price ceiling is imposed at $400, so firms in the market now produce only a quantity of 15,000. As a result, the new consumer surplus is T + V, while the new producer surplus is X. (b) The original equilibrium is $8 at a quantity of 1,800. Consumer surplus is G + H + J, and producer surplus is I + K. A price floor is imposed at $12, which means that **quantity demanded** falls to 1,400. As a result, the new consumer surplus is G, and the new producer surplus is H + I.

Figure 3.8b (b) shows a price floor example using a string of struggling movie theaters, all in the same city. The

current equilibrium is $8 per movie ticket, with 1,800 people attending movies. The original consumer surplus is G + H + J, and producer surplus is I + K. The city government is worried that movie theaters will go out of business, reducing the entertainment options available to citizens, so it decides to impose a price floor of $12 per ticket. As a result, the quantity demanded of movie tickets falls to 1,400. The new consumer surplus is G, and the new producer surplus is H + I. In effect, the price floor causes the area H to be transferred from consumer to producer surplus, but also causes a deadweight loss of J + K.

This analysis shows that a price ceiling, like a law establishing rent controls, will transfer some producer surplus to consumers—which helps to explain why consumers often favor them. Conversely, a price floor like a guarantee that farmers will receive a certain price for their crops will transfer some consumer surplus to producers, which explains why producers often favor them. However, both price floors and price ceilings block some transactions that buyers and sellers would have been willing to make, and creates deadweight loss. Removing such barriers, so that prices and quantities can adjust to their equilibrium level, will increase the economy's social surplus.

Demand and Supply as a Social Adjustment Mechanism

The demand and supply model emphasizes that prices are not set only by demand or only by supply, but by the interaction between the two. In 1890, the famous economist Alfred Marshall wrote that asking whether supply or demand determined a price was like arguing "whether it is the upper or the under blade of a pair of scissors that cuts a piece of paper." The answer is that both blades of the demand and supply scissors are always involved.

The adjustments of equilibrium price and quantity in a market-oriented economy often occur without much government direction or oversight. If the coffee crop in Brazil suffers a terrible frost, then the supply curve of coffee shifts to the left and the price of coffee rises. Some people—call them the coffee addicts—continue to drink coffee and pay the higher price. Others switch to tea or soft drinks. No government commission is needed to figure out how to adjust coffee prices, which companies will be allowed to process the remaining supply, which supermarkets in which cities will get how much coffee to sell, or which consumers will ultimately be allowed to drink the brew. Such adjustments in response to price changes happen all the time in a market economy, often so smoothly and rapidly that we barely notice them.

Think for a moment of all the seasonal foods that are available and inexpensive at certain times of the year, like fresh corn in midsummer, but more expensive at other times of the year. People alter their diets and restaurants alter their menus in response to these fluctuations in prices without fuss or fanfare. For both the U.S. economy and the world economy as a whole, markets—that is, demand and supply—are the primary social mechanism for answering the basic questions about what is produced, how it is produced, and for whom it is produced.

Bring It Home

Why Can We Not Get Enough of Organic?

Organic food is grown without synthetic pesticides, chemical fertilizers or genetically modified seeds. In recent decades, the demand for organic products has increased dramatically. The Organic Trade Association reported sales increased from $1 billion in 1990 to $35.1 billion in 2013, more than 90% of which were sales of food products.

Why, then, are organic foods more expensive than their conventional counterparts? The answer is a clear application of the theories of supply and demand. As people have learned more about the harmful effects of chemical fertilizers, growth hormones, pesticides and the like from large-scale factory farming, our tastes and preferences for safer, organic foods have increased. This change in tastes has been reinforced by increases in income, which allow people to purchase pricier products, and has made organic foods more mainstream. This has led to an increased demand for organic foods. Graphically, the demand curve has shifted right, and we have moved up the supply curve as producers have responded to the higher prices by supplying a greater quantity.

In addition to the movement along the supply curve, we have also had an increase in the number of farmers converting to organic farming over time. This is represented by a shift to the right of the supply curve. Since both demand and supply have shifted to the right, the resulting equilibrium quantity of organic foods is definitely higher, but the price will only fall when the increase in supply is larger than the increase in demand. We may need more time before we see lower prices in organic foods. Since the production costs of these foods may remain higher than conventional farming, because organic fertilizers and pest management techniques are more expensive, they may never fully catch up with the lower prices of non-organic foods.

As a final, specific example: The Environmental Working Group's "Dirty Dozen" list of fruits and vegetables, which test high for pesticide residue even after washing, was released in April 2013. The inclusion of strawberries on the list has led to an increase in demand for organic strawberries, resulting in both a higher equilibrium price and quantity of sales.

Key Concepts and Summary

Consumer surplus is the gap between the price that consumers are willing to pay, based on their preferences, and the market equilibrium price. Producer surplus is the gap between the price for which producers are willing to sell a product, based on their costs, and the market equilibrium price. Social surplus is the sum of consumer surplus and producer surplus. Total surplus is larger at the equilibrium quantity and price than it will be at any other quantity and price. Deadweight loss is loss in total surplus that occurs when the economy produces at an inefficient quantity.

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- Figure 3.24 Efficiency and Price Floors and Ceilings © Steven A. Greenlaw & David Shapiro (OpenStax) is licensed under a CC BY (Attribution) license

3.9 - PRICE CEILINGS AND PRICE FLOORS

Learning Objectives

- Explain price controls, price ceilings, and price floors
- Analyze demand and supply as a social adjustment mechanism

To this point in the chapter, we have been assuming that markets are free, that is, they operate with no government intervention. In this section, we will explore the outcomes, both anticipated and otherwise, when government does intervene in a market either to prevent the **price** of some good or service from rising "too high" or to prevent the price of some good or service from falling "too low".

Economists believe there are a small number of fundamental principles that explain how economic agents respond in different situations. Two of these principles, which we have already introduced, are the laws of demand and supply.

Governments can pass laws affecting market outcomes, but no law can negate these economic principles. Rather, the principles will become apparent in sometimes unexpected ways, which may undermine the intent of the government policy. This is one of the major conclusions of this section.

Controversy sometimes surrounds the prices and quantities established by demand and supply, especially for products that are considered necessities. In some cases, discontent over prices turns into public pressure on politicians, who may then pass legislation to prevent a certain price from climbing "too high" or falling "too low."

The demand and supply model shows how people and firms will react to the incentives that these laws provide to control prices, in ways that will often lead to undesirable consequences. Alternative policy tools can often achieve the desired goals of price control laws, while avoiding at least some of their costs and tradeoffs.

Price Ceilings

Laws that government enact to regulate prices are called **price controls**. Price controls come in two flavors. A **price ceiling** keeps a price from rising above a certain level (the "ceiling"), while a **price floor** keeps a price from falling below a given level (the "floor"). This section uses the demand and supply framework to analyze price ceilings. The next section discusses price floors.

A price ceiling is a legal maximum price that one pays for some good or service. A government imposes price ceilings in order to keep the price of some necessary good or service affordable. For example, in 2005 during Hurricane Katrina, the price of bottled water increased above $5 per gallon. As a result, many people called for price controls on bottled water to prevent the price from rising so high. In this particular case, the government did not impose a price ceiling, but there are other examples of where price ceilings did occur.

In many markets for goods and services, demanders outnumber suppliers. Consumers, who are also potential voters, sometimes unite behind a political proposal to hold down a certain price. In some cities, such as Albany, renters have pressed political leaders to pass rent control laws, a price ceiling that usually works by stating that landlords can raise rents by only a certain maximum percentage each year. Some of the best examples of rent control occur in urban areas such as New York, Washington D.C., or San Francisco.

Rent control becomes a politically hot topic when rents begin to rise rapidly. Everyone needs an affordable place to live. Perhaps a change in tastes makes a certain suburb or town a more popular place to live. Perhaps locally-based businesses expand, bringing higher incomes and more people into the area. Such changes can cause a change in the demand for rental housing, as Figure 3.9a illustrates. The original equilibrium (E_0) lies at the intersection of supply curve S_0 and demand curve D_0, corresponding to an equilibrium price of $500 and an equilibrium quantity of 15,000 units of rental housing. The effect of greater income or a change in tastes is to shift the demand curve for rental housing to the right, as the data in Table 3.9a shows and the shift from D_0 to D_1 on the graph. In this market, at the new equilibrium E_1, the price of a rental unit would rise to $600 and the equilibrium quantity would increase to 17,000 units.

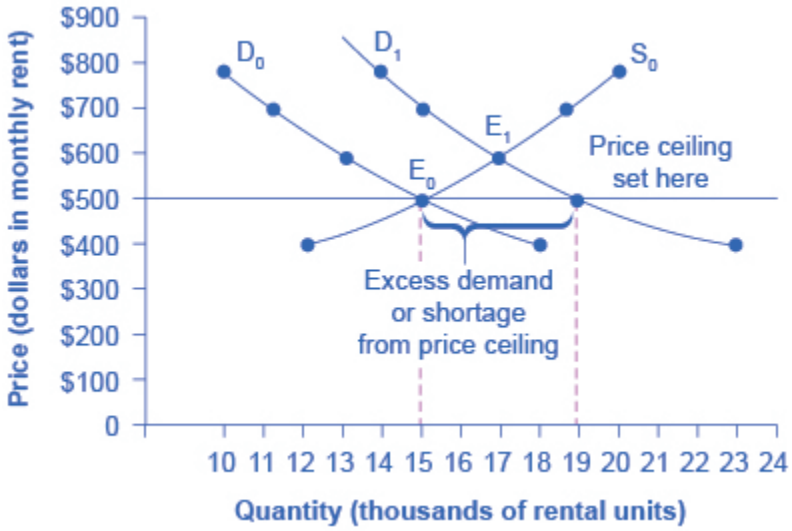

Figure 3.9a A Price Ceiling Example—Rent Control. Figure by Steven A. Greenlaw & David Shapiro (OpenStax), licensed under CC BY 4.0.

Figure 3.9a A Price Ceiling Example—Rent Control (Text Version)

The vertical axis is Price (dollars in monthly rent) in increments of $100 and the horizontal axis is Quantity (thousands of rental units) going up by increments by a thousand.
D_0 is the original demand curve that slopes downward left to right. S_0 is the supply curve and slopes upward from left to right. The original intersection of demand and supply occurs at E_0 (15,000 rental units, $500 in monthly rent). If demand shifts from D_0 to the left to the new demand curve D_1,which still slopes downward left to right.
After the shift the new equilibrium would be at E_1 (17,000 rental units, $600 in monthly rent) occurring at the intersection of S_0 and D_1. But if there is a price ceiling at $500 (denoted by a flat line at $500) then the price is not permitted to rise, therefore instead of E_1 (17,000 rental units, $600 in monthly rent), the quantity supplied remains at 15,000. However, after the change in demand, the quantity demanded rises to 19,000, resulting in a shortage resulting in a new point intersecting D_1 and the price ceiling at ($19,000 rental units, $500 in monthly rent).

Figure 3.9a A Price Ceiling Example—Rent Control: The original intersection of demand and supply occurs at E0. If demand shifts from D0 to D1, the new equilibrium would be at E1—unless a price ceiling prevents the price from rising. If the price is not permitted to rise, the quantity supplied remains at 15,000. However, after the change in demand, the quantity demanded rises to 19,000, resulting in a shortage.

Table 3.9a Rent Control

Price	Original Quantity Supplied	Original Quantity Demanded	New Quantity Demanded
$400	12,000	18,000	23,000
$500	15,000	15,000	19,000
$600	17,000	13,000	17,000
$700	19,000	11,000	15,000
$800	20,000	10,000	14,000

Suppose that a city government passes a rent control law to keep the price at the original equilibrium of $500 for a typical apartment. In Figure 3.9a, the horizontal line at the price of $500 shows the legally fixed maximum price set by the rent control law. However, the underlying forces that shifted the demand curve to the right are still there. At that price ($500), the quantity supplied remains at the same 15,000 rental units, but the quantity demanded is 19,000 rental units. In other words, the quantity demanded exceeds the quantity supplied, so there is a shortage of rental housing. One of the ironies of price ceilings is that while the price ceiling was intended to help renters, there are actually fewer apartments rented out under the price ceiling (15,000 rental units) than would be the case at the market rent of $600 (17,000 rental units).

Price ceilings do not simply benefit renters at the expense of landlords. Rather, some renters (or potential renters) lose their housing as landlords convert apartments to co-ops and condos. Even when the housing remains in the rental market, landlords tend to spend less on maintenance and on essentials like heating, cooling, hot water, and lighting. The first rule of economics is you do not get something for nothing—everything has an opportunity cost. Thus, if renters obtain "cheaper" housing than the market requires, they tend to also end up with lower quality housing.

Price ceilings are enacted in an attempt to keep prices low for those who need the product. However, when the market price is not allowed to rise to the equilibrium level, quantity demanded exceeds quantity supplied, and thus a shortage occurs. Those who manage to purchase the product at the lower price given by the price ceiling will benefit, but sellers of the product will suffer, along with those who are not able to purchase the product at all. Quality is also likely to deteriorate.

Price Floors

A price floor is the lowest price that one can legally pay for some good or service. Perhaps the best-known example of a price floor is the minimum wage, which is based on the view that someone working full time should be able to afford a basic standard of living. The federal minimum wage in 2016 was $7.25 per hour, although some states and localities have a higher minimum wage. The federal minimum wage yields an annual

income for a single person of $15,080, which is slightly higher than the Federal poverty line of $11,880. As the cost of living rises over time, the Congress periodically raises the federal minimum wage.

Price floors are sometimes called "price supports," because they support a price by preventing it from falling below a certain level. Around the world, many countries have passed laws to create agricultural price supports. Farm prices and thus farm incomes fluctuate, sometimes widely. Even if, on average, farm incomes are adequate, some years they can be quite low. The purpose of price supports is to prevent these swings.

The most common way price supports work is that the government enters the market and buys up the product, adding to demand to keep prices higher than they otherwise would be. According to the Common Agricultural Policy reform passed in 2013, the European Union (EU) will spend about 60 billion euros per year, or 67 billion dollars per year (with the November 2016 exchange rate), or roughly 38% of the EU budget, on price supports for Europe's farmers from 2014 to 2020.

Figure 3.9b illustrates the effects of a government program that assures a price above the equilibrium by focusing on the market for wheat in Europe. In the absence of government intervention, the price would adjust so that the quantity supplied would equal the quantity demanded at the equilibrium point E_0, with price P_0 and quantity Q_0. However, policies to keep prices high for farmers keeps the price above what would have been the market equilibrium level—the price Pf shown by the dashed horizontal line in the diagram. The result is a quantity supplied in excess of the quantity demanded (Qd). When quantity supplied exceeds quantity demanded, a surplus exists.

Economists estimate that the high-income areas of the world, including the United States, Europe, and Japan, spend roughly $1 billion per day in supporting their farmers. If the government is willing to purchase the **excess supply** (or to provide payments for others to purchase it), then farmers will benefit from the price floor, but taxpayers and consumers of food will pay the costs. Agricultural economists and policy makers have offered numerous proposals for reducing farm subsidies. In many countries, however, political support for subsidies for farmers remains strong. This is either because the population views this as supporting the traditional rural way of life or because of industry's lobbying power of the agro-business.

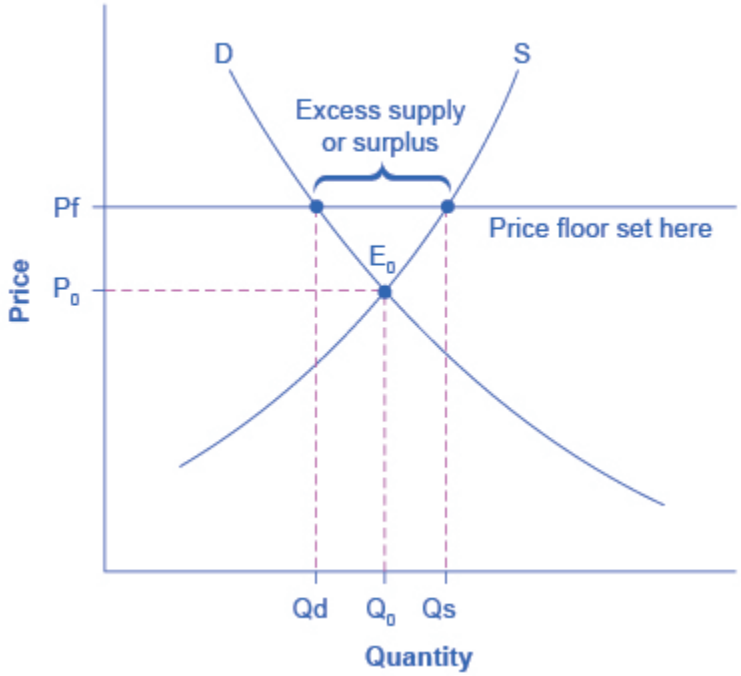

Figure 3.9b European Wheat Prices: A Price Floor Example. Figure by Steven A. Greenlaw & David Shapiro (OpenStax), licensed under CC BY 4.0.

Figure 3.9b European Wheat Prices: A Price Floor Example (Text Version)

The vertical axis is Price (P) and the horizontal axis is Quantity (Q).
The demand curve (D) slopes in a downward curve from left to right. The supply curve (S) slopes downward from right to left. The intersection of demand (D) and supply (S) would be at the equilibrium point E0 at (Q0, P0). However, a price floor set at Pf holds the price above E_0 and prevents it from falling.
The Price floor (Pf) is denoted by a flat line intersecting with the S and D curves above point E_0, creating two new points where they intersect. The result of the price floor is that the quantity supplied Qs (occurring at the intersection of Pf and S and to the right of Q_0) exceeds the quantity demanded Qd (occurring at the intersection of Pf and D and to the left of Q_0). The difference between these two points shows the excess supply, also called a surplus.

Figure 3.9b European Wheat Prices: A Price Floor Example The intersection of demand (D) and supply (S) would be at the equilibrium point E0. However, a price floor set at Pf holds the price above E0 and prevents it from falling. The result of the price floor is that the quantity supplied Qs exceeds the quantity demanded Qd. There is excess supply, also called a surplus.

Key Concepts and Summary

Price ceilings prevent a price from rising above a certain level. When a price ceiling is set below the equilibrium price, quantity demanded will exceed quantity supplied, and excess demand or shortages will result. Price floors prevent a price from falling below a certain level. When a price floor is set above the equilibrium price, quantity supplied will exceed quantity demanded, and excess supply or surpluses will result. Price floors and price ceilings often lead to unintended consequences.

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3.10 - SELF-CHECK, CRITICAL THINKING & REVIEW QUESTIONS

Self-Check Questions

1. Review Figure 3.5c.Suppose the price of gasoline is $1.60 per gallon. Is the quantity demanded higher or lower than at the equilibrium price of $1.40 per gallon? What about the quantity supplied? Is there a shortage or a surplus in the market? If so, how much?
2. Why do economists use the *ceteris paribus* assumption?
3. In an analysis of the market for paint, an economist discovers the facts listed below. State whether each of these changes will affect supply or demand, and in what direction.
    1. There have recently been some important cost-saving inventions in the technology for making paint.
    2. Paint is lasting longer, so that property owners need not repaint as often.
    3. Because of severe hailstorms, many people need to repaint now.
    4. The hailstorms damaged several factories that make paint, forcing them to close down for several months.
4. Many changes are affecting the market for oil. Predict how each of the following events will affect the equilibrium price and quantity in the market for oil. In each case, state how the event will affect the supply and demand diagram. Create a sketch of the diagram if necessary.
    1. Cars are becoming more fuel efficient, and therefore get more miles to the gallon.
    2. The winter is exceptionally cold.
    3. A major discovery of new oil is made off the coast of Norway.
    4. The economies of some major oil-using nations, like Japan, slow down.
    5. A war in the Middle East disrupts oil-pumping schedules.

6. Landlords install additional insulation in buildings.
7. The price of solar energy falls dramatically.
8. Chemical companies invent a new, popular kind of plastic made from oil

5. Let's think about the market for air travel. From August 2014 to January 2015, the price of jet fuel increased roughly 47%. Using the four-step analysis, how do you think this fuel price increase affected the equilibrium price and quantity of air travel?
6. A tariff is a tax on imported goods. Suppose the U.S. government cuts the tariff on imported flat screen televisions. Using the four-step analysis, how do you think the tariff reduction will affect the equilibrium price and quantity of flat screen TVs?
7. What is the effect of a price ceiling on the quantity demanded of the product? What is the effect of a price ceiling on the quantity supplied? Why exactly does a price ceiling cause a shortage?
8. Does a price ceiling change the equilibrium price?
9. What would be the impact of imposing a price floor below the equilibrium price?
10. Does a price ceiling increase or decrease the number of transactions in a market? Why? What about a price floor?
11. If a price floor benefits producers, why does a price floor reduce social surplus?

Check your answers

1. Since $1.60 per gallon is above the equilibrium price, the quantity demanded would be lower at 550 gallons and the quantity supplied would be higher at 640 gallons. (These results are due to the laws of demand and supply, respectively.) The outcome of lower Qd and higher Qs would be a surplus in the gasoline market of 640 – 550 = 90 gallons.
2. To make it easier to analyze complex problems. *Ceteris paribus* allows you to look at the effect of one factor at a time on what it is you are trying to analyze. When you have analyzed all the factors individually, you add the results together to get the final answer.
3. An improvement in technology that reduces the cost of production will cause an increase in supply. Alternatively, you can think of this as a reduction in price necessary for firms to supply any quantity. Either way, this can be shown as a rightward (or downward) shift in the supply curve.

    1. An improvement in product quality is treated as an increase in tastes or preferences, meaning consumers demand more paint at any price level, so demand increases or shifts to the right. If this seems counterintuitive, note that demand in the future for the longer-lasting paint will fall, since consumers are essentially shifting demand from

the future to the present.
2. An increase in need causes an increase in demand or a rightward shift in the demand curve.
3. Factory damage means that firms are unable to supply as much in the present. Technically, this is an increase in the cost of production. Either way you look at it, the supply curve shifts to the left.

4. More fuel-efficient cars means there is less need for gasoline. This causes a leftward shift in the demand for gasoline and thus oil. Since the demand curve is shifting down the supply curve, the equilibrium price and quantity both fall.

1. Cold weather increases the need for heating oil. This causes a rightward shift in the demand for heating oil and thus oil. Since the demand curve is shifting up the supply curve, the equilibrium price and quantity both rise.
2. A discovery of new oil will make oil more abundant. This can be shown as a rightward shift in the supply curve, which will cause a decrease in the equilibrium price along with an increase in the equilibrium quantity. (The supply curve shifts down the demand curve so price and quantity follow the law of demand. If price goes down, then the quantity goes up.)
3. When an economy slows down, it produces less output and demands less input, including energy, which is used in the production of virtually everything. A decrease in demand for energy will be reflected as a decrease in the demand for oil, or a leftward shift in demand for oil. Since the demand curve is shifting down the supply curve, both the equilibrium price and quantity of oil will fall.
4. Disruption of oil pumping will reduce the supply of oil. This leftward shift in the supply curve will show a movement up the demand curve, resulting in an increase in the equilibrium price of oil and a decrease in the equilibrium quantity.
5. Increased insulation will decrease the demand for heating. This leftward shift in the demand for oil causes a movement down the supply curve, resulting in a decrease in the equilibrium price and quantity of oil.
6. Solar energy is a substitute for oil-based energy. So if solar energy becomes cheaper, the demand for oil will decrease as consumers switch from oil to solar. The decrease in demand for oil will be shown as a leftward shift in the demand curve. As the demand curve shifts down the supply curve, both equilibrium price and quantity for oil will fall.
7. A new, popular kind of plastic will increase the demand for oil. The increase in demand will be shown as a rightward shift in demand, raising the equilibrium price and

quantity of oil.

5. Step 1. Draw the graph with the initial supply and demand curves. Label the initial equilibrium price and quantity. Step 2. Did the economic event affect supply or demand? Jet fuel is a cost of producing air travel, so an increase in jet fuel price affects supply. Step 3. An increase in the price of jet fuel caused an increase in the cost of air travel. We show this as an upward or leftward shift in supply. Step 4. A leftward shift in supply causes a movement up the demand curve, increasing the equilibrium price of air travel and decreasing the equilibrium quantity.
6. Step 1. Draw the graph with the initial supply and demand curves. Label the initial equilibrium price and quantity.Step 2. Did the economic event affect supply or demand? A tariff is treated like a cost of production, so this affects supply.Step 3. A tariff reduction is equivalent to a decrease in the cost of production, which we can show as a rightward (or downward) shift in supply.Step 4. A rightward shift in supply causes a movement down the demand curve, lowering the equilibrium price and raising the equilibrium quantity.
7. A price ceiling (which is below the equilibrium price) will cause the quantity demanded to rise and the quantity supplied to fall. This is why a price ceiling creates a shortage.
8. A price ceiling is just a legal restriction. Equilibrium is an economic condition. People may or may not obey the price ceiling, so the actual price may be at or above the price ceiling, but the price ceiling does not change the equilibrium price.
9. A price ceiling is a legal maximum price, but a price floor is a legal minimum price and, consequently, it would leave room for the price to rise to its equilibrium level. In other words, a price floor below equilibrium will not be binding and will have no effect.
10. Assuming that people obey the price ceiling, the market price will be below equilibrium, which means that Qd will be more than Qs. Buyers can only buy what is offered for sale, so the number of transactions will fall to Qs. This is easy to see graphically. By analogous reasoning, with a price floor the market price will be above the equilibrium price, so Qd will be less than Qs. Since the limit on transactions here is demand, the number of transactions will fall to Qd. Note that because both price floors and price ceilings reduce the number of transactions, social surplus is less.
11. Because the losses to consumers are greater than the benefits to producers, so the net effect is negative. Since the lost consumer surplus is greater than the additional producer surplus, social surplus falls.

Critical Thinking Questions

1. Review Figure 3.5c. Suppose the government decided that, since gasoline is a necessity, its price should be legally capped at $1.30 per gallon. What do you anticipate would be the outcome in the gasoline market?
2. Explain why the following statement is false: "In the goods market, no buyer would be willing to pay more than the equilibrium price."
3. Explain why the following statement is false: "In the goods market, no seller would be willing to sell for less than the equilibrium price."
4. Consider the demand for hamburgers. If the price of a substitute good (for example, hot dogs) increases and the price of a complement good (for example, hamburger buns) increases, can you tell for sure what will happen to the demand for hamburgers? Why or why not? Illustrate your answer with a graph.
5. How do you suppose the demographics of an aging population of "Baby Boomers" in the United States will affect the demand for milk? Justify your answer.
6. We know that a change in the price of a product causes a movement along the demand curve. Suppose consumers believe that prices will be rising in the future. How will that affect demand for the product in the present? Can you show this graphically?
7. Suppose there is a soda tax to curb obesity. What should a reduction in the soda tax do to the supply of sodas and to the equilibrium price and quantity? Can you show this graphically? *Hint*: Assume that the soda tax is collected from the sellers.
8. Use the four-step process to analyze the impact of the advent of the iPod (or other portable digital music players) on the equilibrium price and quantity of the Sony Walkman (or other portable audio cassette players).
9. Use the four-step process to analyze the impact of a reduction in tariffs on imports of iPods on the equilibrium price and quantity of Sony Walkman-type products.
10. Suppose both of these events took place at the same time. Combine your analyses of the impacts of the iPod and the tariff reduction to determine the likely impact on the equilibrium price and quantity of Sony Walkman-type products. Show your answer graphically.
11. Most government policy decisions have winners and losers. What are the effects of raising the minimum wage? It is more complex than simply producers lose and workers gain. Who are the winners and who are the losers, and what exactly do they win and lose? To what

extent does the policy change achieve its goals?

12. Agricultural price supports result in governments holding large inventories of agricultural products. Why do you think the government cannot simply give the products away to poor people?
13. Can you propose a policy that would induce the market to supply more rental housing units?
14. What term would an economist use to describe what happens when a shopper gets a "good deal" on a product?
15. Explain why voluntary transactions improve social welfare.
16. Why would a free market never operate at a quantity greater than the equilibrium quantity? *Hint:* What would be required for a transaction to occur at that quantity?

Review Questions

1. What determines the level of prices in a market?
2. What does a downward-sloping demand curve mean about how buyers in a market will react to a higher price?
3. Will demand curves have the same exact shape in all markets? If not, how will they differ?
4. Will supply curves have the same shape in all markets? If not, how will they differ?
5. What is the relationship between quantity demanded and quantity supplied at equilibrium? What is the relationship when there is a shortage? What is the relationship when there is a surplus?
6. How can you locate the equilibrium point on a demand and supply graph?
7. If the price is above the equilibrium level, would you predict a surplus or a shortage? If the price is below the equilibrium level, would you predict a surplus or a shortage? Why?
8. When the price is above the equilibrium, explain how market forces move the market price to equilibrium. Do the same when the price is below the equilibrium.
9. What is the difference between the demand and the quantity demanded of a product, say milk? Explain in words and show the difference on a graph with a demand curve for milk.
10. What is the difference between the supply and the quantity supplied of a product, say milk?

Explain in words and show the difference on a graph with the supply curve for milk.

11. When analyzing a market, how do economists deal with the problem that many factors that affect the market are changing at the same time?
12. Name some factors that can cause a shift in the demand curve in markets for goods and services.
13. Name some factors that can cause a shift in the supply curve in markets for goods and services.
14. How does one analyze a market where both demand and supply shift?
15. What causes a movement along the demand curve? What causes a movement along the supply curve?
16. Does a price ceiling attempt to make a price higher or lower?
17. How does a price ceiling set below the equilibrium level affect quantity demanded and quantity supplied?
18. Does a price floor attempt to make a price higher or lower?
19. How does a price floor set above the equilibrium level affect quantity demanded and quantity supplied?
20. What is consumer surplus? How is it illustrated on a demand and supply diagram?
21. What is producer surplus? How is it illustrated on a demand and supply diagram?
22. What is total surplus? How is it illustrated on a demand and supply diagram?
23. What is the relationship between total surplus and economic efficiency?
24. What is deadweight loss?

Problems

1. Review Figure 3.5c . Suppose the price of gasoline is $1.00. Will the quantity demanded be lower or higher than at the equilibrium price of $1.40 per gallon? Will the quantity supplied be lower or higher? Is there a shortage or a surplus in the market? If so, of how much?
2. Table 3.10a shows information on the demand and supply for bicycles, where the quantities of bicycles are measured in thousands.

Price	
$120	
$150	
$180	
$210	
$240	

1. What is the quantity demanded and the quantity supplied at a price of $210?
2. At what price is the quantity supplied equal to 48,000?
3. Graph the demand and supply curve for bicycles. How can you determine the equilibrium price and quantity from the graph? How can you determine the equilibrium price and quantity from the table? What are the equilibrium price and equilibrium quantity?
4. If the price was $120, what would the quantities demanded and supplied be? Would a shortage or surplus exist? If so, how large would the shortage or surplus be?

3. The computer market in recent years has seen many more computers sell at much lower prices. What shift in demand or supply is most likely to explain this outcome? Sketch a demand and supply diagram and explain your reasoning for each.

    1. A rise in demand
    2. A fall in demand
    3. A rise in supply
    4. A fall in supply

4. Table 3.10b illustrates the market's demand and supply for cheddar cheese. Graph the data and find the equilibrium. Next, create a table showing the change in quantity demanded or quantity supplied, and a graph of the new equilibrium, in each of the following situations:

    1. The price of milk, a key input for cheese production, rises, so that the supply decreases by 80 pounds at every price.
    2. A new study says that eating cheese is good for your health, so that demand increases by 20% at every price.

Table 3.10b

Price per Pound	Qd	Qs
$3.00	750	540
$3.20	700	600
$3.40	**650**	**650**
$3.60	620	700
$3.80	600	720
$4.00	590	730

5. Table 3.10c shows the supply and demand for movie tickets in a city. Graph demand and supply and identify the equilibrium. Then calculate in a table and graph the effect of the following two changes.
    a. Three new nightclubs open. They offer decent bands and have no cover charge, but make their money by selling food and drink. As a result, demand for movie tickets falls by six units at every price.
    b. The city eliminates a tax that it placed on all local entertainment businesses. The result is that the quantity supplied of movies at any given price increases by 10%.

Table 3.10c

Price per Ticket	Qd	Qs
$5.00	26	16
$6.00	24	18
$7.00	22	20
$8.00	21	21
$9.00	20	22

6. A low-income country decides to set a price ceiling on bread so it can make sure that bread is affordable to the poor. Table 3.10d provides the conditions of demand and supply. What are the equilibrium price and equilibrium quantity before the price ceiling? What will the excess demand or the shortage (that is, quantity demanded minus quantity supplied) be if the price ceiling is set at $2.40? At $2.00? At $3.60?

Table 3.10d

Price	Qd	Qs
$1.60	9,000	5,000
$2.00	8,500	5,500
$2.40	8,000	6,400
$2.80	**7,500**	**7,500**
$3.20	7,000	9,000
$3.60	6,500	11,000
$4.00	6,000	15,000

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3.11 - LEARN BY DOING: SHORTAGE AND SURPLUS

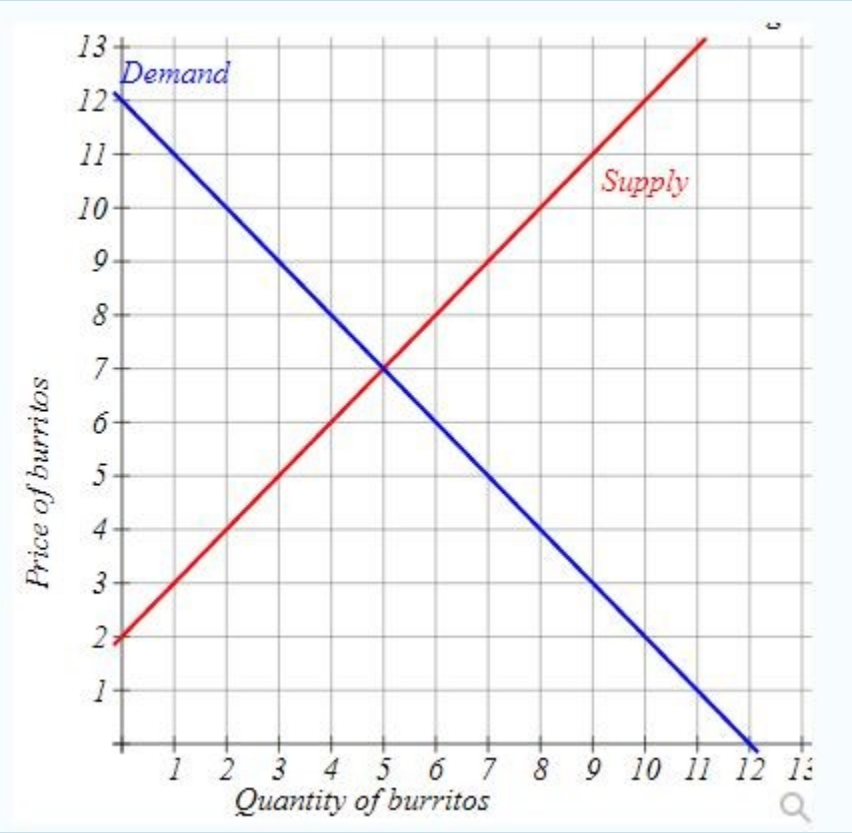
Try It

Rather than have you read more about shortage and surplus, we'd prefer to have you practice what you've learned so far and see for yourself if you understand it.

These questions allow you to get as much practice as you need, as you can click the link at the top of the first question ("Try another version of these questions") to get a new version of the questions. Practice until you feel comfortable doing these questions.

An interactive H5P element has been excluded from this version of the text. You can view it online here: https://ecampusontario.pressbooks.pub/laboureconomics/?p=713#h5p-10

Try it (Text Version)



H5P Graph. Graph by Lumen Learning, licensed under CC BY.

H5P Graph (Text Version)

The vertical axis is price of bagels and the horizontal axis is quantity of bagels. The demand curve slopes downward from left to right and the supply curve slopes upward from right to left. The demand and supply curve intersects at 7 price of bagels and 3 quantity of bagels. See table below for graph data.

Graph data

Supply Curve (quantity of bagels, price of bagels)	Demand Curve (quantity of bagels, price of bagels)
0 quantity of bagels, 4 price of bagels	0 quantity of bagels, 10 price of bagels
1 quantity of bagels, 5 price of bagels	1 quantity of bagels, 9 price of bagels
2 quantity of bagels, 6 price of bagels	2 quantity of bagels, 8 price of bagels
3 quantity of bagels, 7 price of bagels	3 quantity of bagels, 7 price of bagels
4 quantity of bagels, 8 price of bagels	4 quantity of bagels, 6 price of bagels
5quantity of bagels, 9 price of bagels	5quantity of bagels, 5 price of bagels
6 quantity of bagels, 10 price of bagels	6 quantity of bagels, 4 price of bagels
7 quantity of bagels, 11 price of bagels	7 quantity of bagels, 3 price of bagels
8 quantity of bagels, 12 price of bagels	8 quantity of bagels, 2 price of bagels
9 quantity of bagels, 13 price of bagels	9 quantity of bagels, 1 price of bagels
–	10 quantity of bagels, 0 price of bagels

Use the graph above to answer the following questions:

1. First consider a situation without any government interventions and no price controls. In that case equilibrium quantity is: _____
   Tip: At the equilibrium quantity, quantity supplied equals to quality demanded
2. First consider a situation without any government interventions and no price controls. In that case equilibrium quantity is: _____
   Tip: At the equilibrium price, quantity supplied equals to quantity demanded
3. Now suppose that the government imposes a Price Ceiling equal to $7!
   As a result of this new policy, quantity demanded is: _____
   Tip: First consider if the price ceiling is binding or non binding. If binding, trace that price to the demand curve
4. Now suppose that the government imposes a Price Ceiling equal to $7!
   As a result of this new policy, quantity supplied is:_____
   Tip: First consider if the price ceiling is binding or non binding. If binding, trace that price to the supply curve
5. As a result of this Price Ceiling the market is experiencing:

   a. Surplus
   b. This price control is non-binding. There will be neither a shortage nor a surplus.

c. Shortage

6. The amount of surplus/shortage equals _____.
   Tip: If this price ceiling is binding you should be looking at the difference between the quantity demanded and the quantity supplied in question above.

Check Your answer: [1]

Activity source: "Learn By Doing: Shortage and Surplus" In by Lumen Learning, licensed under CC BY. / Converted to H5P and Text.

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1. **Question 1)** 3 , **Question 2)** 5, **Question 3)** 3, **Question 4)** 3, **Question 5)** This price control is non-binding. There will be neither a shortage nor a surplus. , **Question 6)** 0

3.12 - REVIEW AND PRACTICE

Summary

In this chapter we have examined the model of demand and supply. We found that a demand curve shows the quantity demanded at each price, all other things unchanged. The law of demand asserts that an increase in price reduces the quantity demanded and a decrease in price increases the quantity demanded, all other things unchanged. The supply curve shows the quantity of a good or service that sellers will offer at various prices, all other things unchanged. Supply curves are generally upward sloping: an increase in price generally increases the quantity supplied, all other things unchanged.

The equilibrium price occurs where the demand and supply curves intersect. At this price, the quantity demanded equals the quantity supplied. A price higher than the equilibrium price increases the quantity supplied and reduces the quantity demanded, causing a surplus. A price lower than the equilibrium price increases the quantity demanded and reduces the quantity supplied, causing a shortage. Usually, market surpluses and shortages are short-lived. Changes in demand or supply, caused by changes in the determinants of demand and supply otherwise held constant in the analysis, change the equilibrium price and output. The circular flow model allows us to see how demand and supply in various markets are related to one another.

Concept Problems

1. What do you think happens to the demand for pizzas during the Super Bowl? Why?
2. Which of the following goods are likely to be classified as normal goods or services? Inferior? Defend your answer.

    1. Beans
    2. Tuxedos
    3. Used cars
    4. Used clothing
    5. Computers
    6. Books reviewed in *The New York Times*
    7. Macaroni and cheese
    8. Calculators
    9. Cigarettes
    10. Caviar
    11. Legal services

3. Which of the following pairs of goods are likely to be classified as substitutes? Complements? Defend your answer.

    1. Peanut butter and jelly
    2. Eggs and ham
    3. Nike brand and Reebok brand sneakers
    4. IBM and Apple Macintosh brand computers
    5. Dress shirts and ties
    6. Airline tickets and hotels
    7. Gasoline and tires
    8. Beer and wine
    9. Faxes and first-class mail
    10. Cereal and milk
    11. Cereal and eggs

4. A study found that lower airfares led some people to substitute flying for driving to their

vacation destinations. This reduced the demand for car travel and led to reduced traffic fatalities, since air travel is safer per passenger mile than car travel. Using the logic suggested by that study, suggest how each of the following events would affect the number of highway fatalities in any one year.

1. An increase in the price of gasoline
2. A large reduction in rental rates for passenger vans
3. An increase in airfares

5. Children under age 2 are now allowed to fly free on U.S. airlines; they usually sit in their parents' laps. Some safety advocates have urged that they be required to be strapped in infant seats, which would mean their parents would have to purchase tickets for them. Some economists have argued that such a measure would actually increase infant fatalities. Can you say why?
6. The graphs below show four possible shifts in demand or in supply that could occur in particular markets. Relate each of the events described below to one of them.Figure 3.25

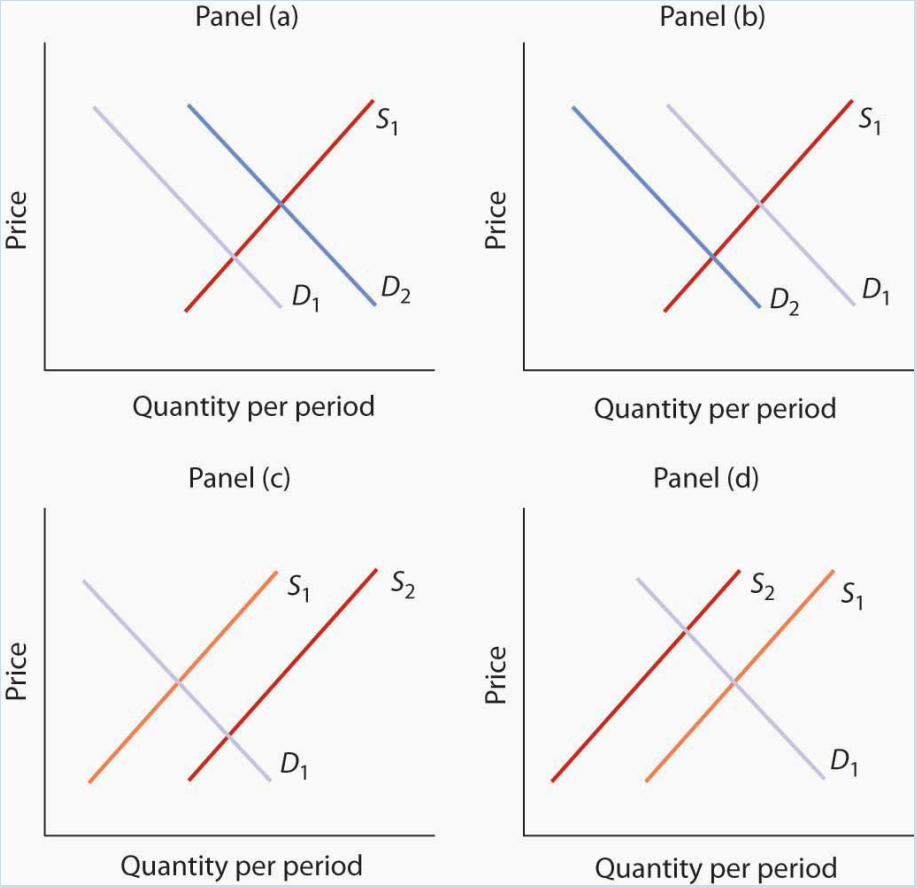

Figure 3.12a. Figure by University of Minnesota, licensed under CC BY-NC-SA 4.0.

Figure 3.12a (Text Version)

Figure 3.12a contains 4 graphs, panel A, B, C, and D. All graphs have the vertical axis Price and horizontal axis Quantity per period.

Panel A: The original supply curve (S_1) is a straight line sloping upwards left to right and occurs in the central-right area of the graph. The original demand curve (D_1) occurs in the middle of the graph sloping downward in a straight line from left to right intersecting lower down the original supply curve (S_1). The new demand curve (D_2) shifts from $D_1$to the left and now intersects the middle of S_1.

Panel B: The original supply curve (S_1) is a straight line sloping upwards left to right and occurs in the central-right area of the graph. The original demand curve (D_1) occurs towards the left side of the graph sloping downward in a straight line from left to right intersecting the middle of S_1. The new demand curve (D2) shifts from D_1 to the right and now intersects lower down the original supply curve (S_1).

Panel C: The original demand curve (D_1) is a straight line sloping downward in a straight line from left to right and occurs in the central-left area of the graph. The original supply curve (S_1) occurs towards the left side of the graph sloping upwards in a straight line from left to right intersecting the middle of D_1. The new supply curve (S2) shifts from S_1 to the right and now intersects lower down the original demand curve (D_1).

Panel D: The original demand curve (D_1) is a straight line sloping downward in a straight line from left to right and occurs in the central-right area of the graph. The original supply curve (S_1) occurs towards the right side of the graph sloping upwards in a straight line from left to right intersecting the middle of D_1. The new supply curve (S_2) shifts from S_1 to the left and now intersects higher up the original demand curve (D_1).

1. How did the heavy rains in South America in 1997 affect the market for coffee?
2. The Surgeon General decides french fries are not bad for your health after all and issues a report endorsing their use. What happens to the market for french fries?
3. How do you think rising incomes affect the market for ski vacations?
4. A new technique is discovered for manufacturing computers that greatly lowers their production cost. What happens to the market for computers?
5. How would a ban on smoking in public affect the market for cigarettes?

7. As low-carb diets increased in popularity, egg prices rose sharply. How might this affect the monks' supply of cookies or private retreats? (See the Case in Point on the Monks of St. Benedict's.)
8. Gasoline prices typically rise during the summer, a time of heavy tourist traffic. A "street talk" feature on a radio station sought tourist reaction to higher gasoline prices. Here was one response: "I don't like 'em [the higher prices] much. I think the gas companies just use any excuse to jack up prices, and they're doing it again now." How does this tourist's perspective differ from that of economists who use the model of demand and supply?
9. The introduction to the chapter argues that preferences for coffee changed in the 1990s and that excessive rain hurt yields from coffee plants. Show and explain the effects of these two circumstances on the coffee market.
10. With preferences for coffee remaining strong in the early part of the century, Vietnam entered the market as a major exporter of coffee. Show and explain the effects of these two circumstances on the coffee market.
11. The study on the economics of obesity discussed in the Case in Point in this chapter on that topic also noted that another factor behind rising obesity is the decline in cigarette smoking as the price of cigarettes has risen. Show and explain the effect of higher cigarette prices on

the market for food. What does this finding imply about the relationship between cigarettes and food?

12. In 2004, *The New York Times* reported that India might be losing its outsourcing edge due to rising wages (Scheiber, 2004) The reporter noted that a recent report "projected that if India continued to produce college graduates at the current rate, demand would exceed supply by 20% in the main outsourcing markets by 2008." Using the terminology you learned in this chapter, explain what he meant to say was happening in the market for Indian workers in outsourcing jobs. In particular, is demand for Indian workers increasing or decreasing? Is the supply of Indian workers increasing or decreasing? Which is shifting faster? How do you know?
13. For more than a century, milk producers have produced skim milk, which contains virtually no fat, along with regular milk, which contains 4% fat. But a century ago, skim milk accounted for only about 1% of total production, and much of it was fed to hogs. Today, skim and other reduced-fat milks make up the bulk of milk sales. What curve shifted, and what factor shifted it?
14. Suppose firms in the economy were to produce fewer goods and services. How do you think this would affect household spending on goods and services? (*Hint:* Use the circular flow model to analyze this question.)

Numerical Problems

Problems 1–5 are based on the graph in Figure 3.26 below.

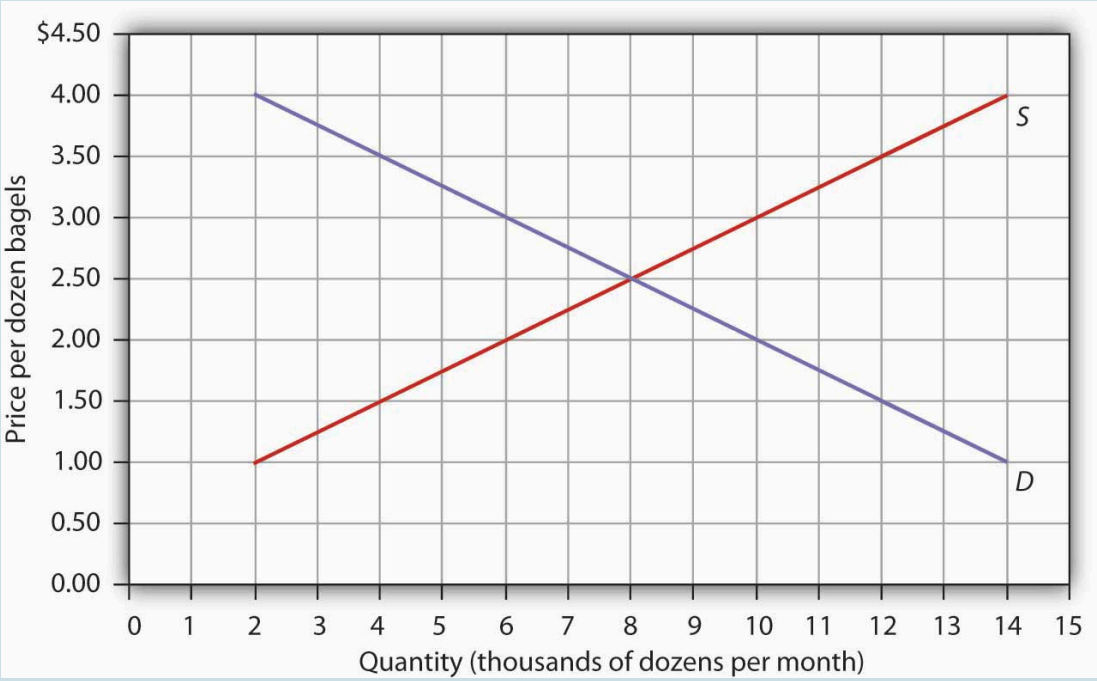

Figure 3.12b. Figure by University of Minnesota, licensed under CC BY-NC-SA 4.0.

Figure 3.12b (Text Version)

Figure 3.12b depicts a graph with the vertical axis Price (per dozen bagels), ranging from $0 to $4.50 increasing with increments of $0.50, and the horizontal axis Quantity (thousands of dozens per month) ranging from 0 to 15 with increasing increments of 1.

The supply curve (S) is a straight line sloping upwards from left to right starting at (2 thousand dozen bagels per month, $1.00 per dozen bagels). The demand curve (D) is a straight line sloping downwards from left to right starting at (2 thousand dozen bagels per month, $4.00 per dozen bagels). The S and D curves intersect at (8 thousand dozen bagels per month, $2.50 per dozen bagels).

Figure 3.12b Supply Curve data points

Points	Price per dozen bagels ($)	Quantity (thousands of dozens per month)
Point 1	1.00	2
Point 2	1.50	4
Point 3	2.00	6
Point 4	2.50	8
Point 5	3.00	10
Point 6	3.50	12
Point 7	4.00	14

Figure 3.12b Demand Curve data points

Points	Price per dozen bagels ($)	Quantity (thousands of dozens per month)
Point 1	4.00	2
Point 2	3.50	4
Point 3	3.00	6
Point 4	2.50	8
Point 5	2.00	10
Point 6	1.50	12
Point 7	1,.00	14

1. At a price of $1.50 per dozen, how many bagels are demanded per month?
2. At a price of $1.50 per dozen, how many bagels are supplied per month?
3. At a price of $3.00 per dozen, how many bagels are demanded per month?
4. At a price of $3.00 per dozen, how many bagels are supplied per month?
5. What is the equilibrium price of bagels? What is the equilibrium quantity per month?

Problems 6–9 are based on the model of demand and supply for coffee as shown in Figure 3.17 "Changes in Demand and Supply" You can graph the initial demand and supply curves by using the following values, with all quantities in millions of pounds of coffee per month:

Problems 6–9 Table 3.12a

Price ($)	Quantity demanded	Quantity supplied
3	40	10
4	35	15
5	30	20
6	25	25
7	20	30
8	15	35
9	10	40

1. Suppose the quantity demanded rises by 20 million pounds of coffee per month at each price. Draw the initial demand and supply curves based on the values given in the table above. Then draw the new demand curve given by this change, and show the new equilibrium price and quantity.
2. Suppose the quantity demanded falls, relative to the values given in the above table, by 20 million pounds per month at prices between $4 and $6 per pound; at prices between $7 and $9 per pound, the quantity demanded becomes zero. Draw the new demand curve and show the new equilibrium price and quantity.
3. Suppose the quantity supplied rises by 20 million pounds per month at each price, while the quantities demanded retain the values shown in the table above. Draw the new supply curve and show the new equilibrium price and quantity.
4. Suppose the quantity supplied falls, relative to the values given in the table above, by 20 million pounds per month at prices above $5; at a price of $5 or less per pound, the quantity supplied becomes zero. Draw the new supply curve and show the new equilibrium price and quantity.

Problems 10–15 are based on the demand and supply schedules for gasoline below (all quantities are in thousands of gallons per week):

Problems 10–15 Table 3.12b

Price per gallon ($)	Quantity demanded	Quantity supplied
1	8	0
2	7	1
3	6	2
4	5	3
5	4	4
6	3	5
7	2	6
8	1	7

1. Graph the demand and supply curves and show the equilibrium price and quantity.
2. At a price of $3 per gallon, would there be a surplus or shortage of gasoline? How much would the surplus or shortage be? Indicate the surplus or shortage on the graph.
3. At a price of $6 per gallon, would there be a surplus or shortage of gasoline? How much would the surplus or shortage be? Show the surplus or shortage on the graph.
4. Suppose the quantity demanded increased by 2,000 gallons per month at each price. At a price of $3 per gallon, how much would the surplus or shortage be? Graph the demand and supply curves and show the surplus or shortage.
5. Suppose the quantity supplied decreased by 2,000 gallons per month at each price for prices between $4 and $8 per gallon. At prices less than $4 per gallon the quantity supplied becomes zero, while the quantities demanded retain the values shown in the table. At a price of $4 per gallon, how much would the surplus or shortage be? Graph the demand and supply curves and show the surplus or shortage.
6. If the demand curve shifts as in problem 13 and the supply curve shifts as in problem 14, without drawing a graph or consulting the data, can you predict whether equilibrium price increases or decreases? What about equilibrium quantity? Now draw a graph that shows what the new equilibrium price and quantity are.

Attribution

Original Source References

Scheiber, N. (2004, May 9). As a center for outsourcing, India could be losing its edge. *New York Times,* p. BU3.

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3.13 - READING LIST

1. Economic and financial indicators [New Tab] (https://www.economist.com/economic-and-financial-indicators)

Reading List compiled by Norm Smith.