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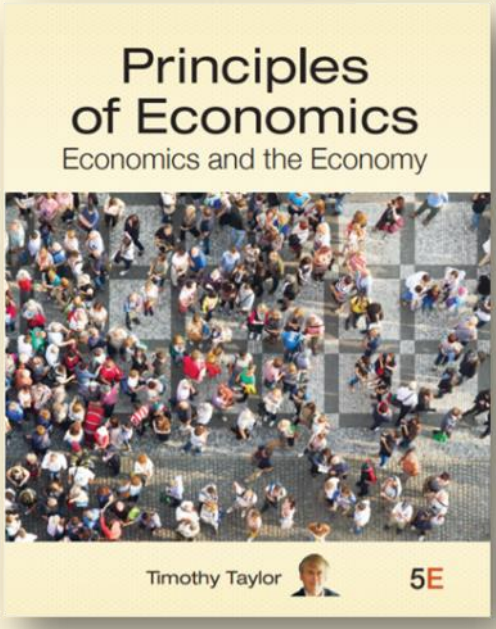

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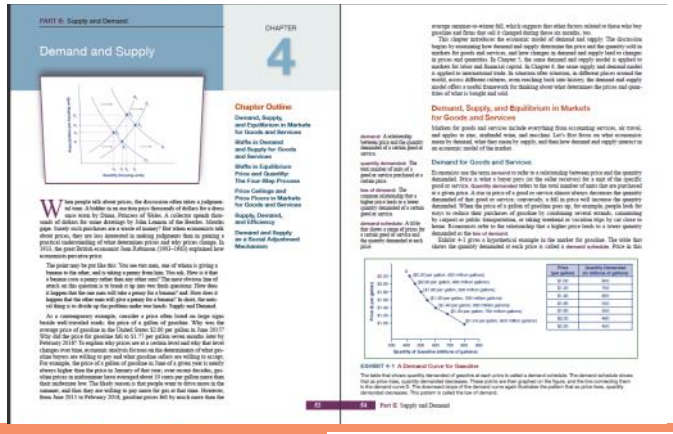

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About the author:

Tim Taylor's career has been devoted to making complex economic ideas clear to students, policy makers and other professional economists. Taylor is the founding and only managing editor of the American Economic Association's *Journal of Economic Perspectives*, which for more than 20 years has been an accessible source for state-of-the art economic thinking. Tim has won numerous teaching awards from his teaching stints at institutions like Stanford, the University of Minnesota and Macalester College.

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summer-to-winter fall, which suggests that other factors related to those who buy gasoline and firms that sell it changed during those six months, too.

This chapter introduces the economic model of demand and supply. The discussion 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. In Chapter 5, the same demand and supply model is applied to markets for labor and financial capital. In Chapter 6, the same supply and demand model is applied to international trade. In situation after situation, in different places around the world, across different cultures, even reaching back into history, the demand and supply model offers a useful framework for thinking about what determines the prices and quantities of what is bought and sold.

Demand, Supply, and Equilibrium in Markets for Goods and Services

Markets for goods and services include everything from accounting services, air travel, and apples to zinc, zinfandel wine, and zucchini. Let's first focus on what economists mean by demand, what they mean by supply, and then how demand and supply interact in an economic model of the market.

Demand for Goods and Services

demand: A relationship between price and the quantity demanded of a certain good or service.

quantity demanded: The total number of units of a good or service purchased at a certain price.

law of demand: The common relationship that a higher price leads to a lower quantity demanded of a certain good or service.

demand schedule: A table that shows a range of prices for a certain good or service and the quantity demanded at each price.

demand curve: A line that shows the relationship between price and quantity demanded of a certain good or service on a graph, with quantity on the horizontal axis and the price on the vertical axis.

Economists use the term **demand** to refer to a relationship between price and the quantity demanded. Price is what a buyer pays (or the seller receives) for a unit of the specific good or service. **Quantity demanded** refers to the total number of units that are purchased at a given price. 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 goes up, for example, people look for ways to reduce their purchases of gasoline by combining several errands, commuting by carpool or public transportation, or taking weekend or vacation trips by car close to home. Economists refer to the relationship that a higher price leads to a lower quantity demanded as the **law of demand**.

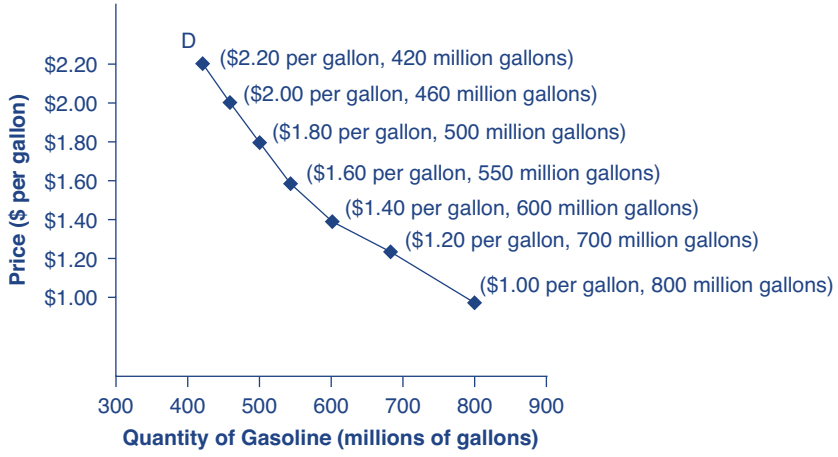
Exhibit 4-1 gives a hypothetical example in the market for gasoline. The table that shows the quantity demanded at each price is called a **demand schedule**. Price in this case is measured per gallon of gasoline. The quantity demanded is measured in millions of gallons. A **demand curve** shows the relationship between price and quantity demanded on a graph, with quantity on the horizontal axis and the price per gallon on the vertical axis. The demand schedule shown by the table and the demand curve shown on the graph are two ways of describing the same relationship between price and quantity demanded.

Each individual good or service needs to be graphed on its own demand curve, because it wouldn't make sense to graph the quantity of apples and the quantity of airplanes on the same diagram. Demand curves will appear somewhat different for each product; for example, they may appear relatively steep or flat, or they may be straight or curved. But nearly all demand curves share the fundamental similarity that they slope down from left to right. In this way, demand curves embody the law of demand; as the price increases,

CLEARING IT UP

Demand Is Not the Same as Quantity Demanded

In economic terminology, demand is not the same as quantity demanded. When economists refer to demand, they mean the relationship between a range of prices and the quantities demanded at those prices, a relationship that can be illustrated with a demand curve or schedule. When economists refer to quantity demanded, they often are referring to the horizontal axis of the demand curve or one column of the demand schedule.



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

EXHIBIT 4-1 A Demand Curve for Gasoline

The table that shows quantity demanded of gasoline at each price is called a demand schedule. The demand schedule shows that as price rises, quantity demanded decreases. These points are then graphed on the figure, and the line connecting them is the demand curve D. The downward slope of the demand curve again illustrates the pattern that as price rises, quantity demanded decreases. This pattern is called the law of demand.

the quantity demanded decreases, and conversely, as the price decreases, the quantity demanded increases.

Supply of Goods and Services

When economists talk about **supply**, they are referring to a relationship between price received for each unit sold and the **quantity supplied**, which is the total number of units sold in the market at a certain price. A rise in price of a good or service 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, profit-seeking firms are encouraged to expand exploration for oil reserves; to carry out additional drilling for oil; to make new investments in pipelines and oil tankers to bring the oil to plants where it can be refined into gasoline; to build new oil refineries; to purchase additional pipelines and trucks to ship the gasoline to gas stations; and to open more gas stations or to keep existing gas stations open longer hours. The pattern that a higher price is associated with a greater quantity supplied is so common that economists have named it the **law of supply**.

Exhibit 4-2 illustrates the law of supply, again using the market for gasoline as an example. A **supply schedule** is a table that shows the quantity supplied at a range of different prices. Again, price is measured per gallon of gasoline and quantity supplied is measured in millions of gallons. A **supply curve** is a graphical 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

supply: A relationship between price and the quantity supplied of a certain good or service.

quantity supplied: The total number of units of a good or service sold at a certain price.

law of supply: The common relationship that a higher price is associated with a greater quantity supplied.

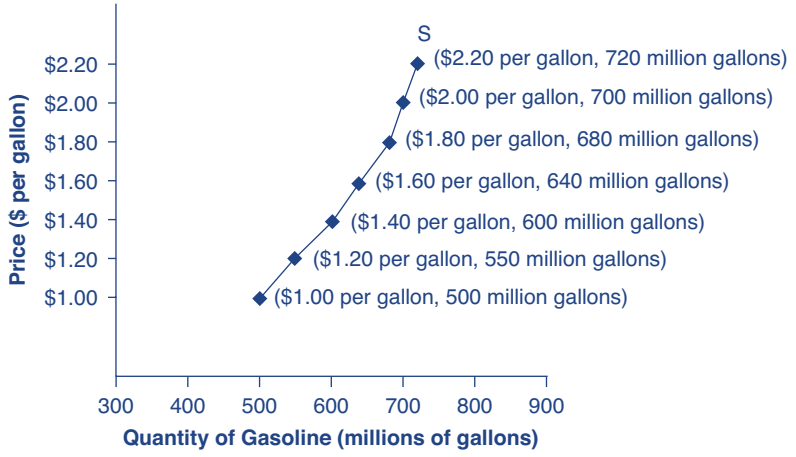
supply schedule: A table that shows a range of prices for a good or service and the quantity supplied at each price.

supply curve: A line that shows the relationship between price and quantity supplied on a graph, with quantity supplied on the horizontal axis and price on the vertical axis.

CLEARING IT UP

Supply Is Not 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 can be illustrated with a supply curve or schedule. When economists refer to quantity supplied, they often are referring to the horizontal axis of the supply curve or one column of the supply schedule.



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

EXHIBIT 4-2 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. 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 pattern that a higher price leads to a higher quantity supplied—a pattern that is common enough to be called the law of supply.

information. Notice that the horizontal and vertical axes on the graph for the supply curve are the same as for the demand curve.

Just as each product has its own demand curve, each product has its own supply curve. The shape of supply curves will vary somewhat according to the product: steeper, flatter, straighter, or curved. But nearly all supply curves share a basic similarity: they slope up from left to right. In that way, the supply curve illustrates the law of supply: as the price rises, the quantity supplied increases, and conversely, as the price falls, the quantity supplied decreases.

Equilibrium—Where Demand and Supply Cross

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.

Exhibit 4-3 illustrates the interaction of demand and supply in the market for gasoline. The demand curve D is identical to Exhibit 4-1. The supply curve S is identical to Exhibit 4-2. When one curve slopes down, like demand, and another curve slopes up, like supply, the curves intersect at some point.

In every economics course you will ever take, when two lines on a diagram cross, this intersection means something! The point where the supply curve S and the demand curve D cross, designated by point E in Exhibit 4-3, is called the equilibrium. The **equilibrium price** is defined as the price where quantity demanded is equal to quantity supplied. The **equilibrium quantity** is the quantity where quantity demanded and quantity supplied are equal at a certain price. In Exhibit 4-3, 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, it would be easy to find the equilibrium by looking for the price level on the tables where the quantity demanded and the quantity supplied are equal.

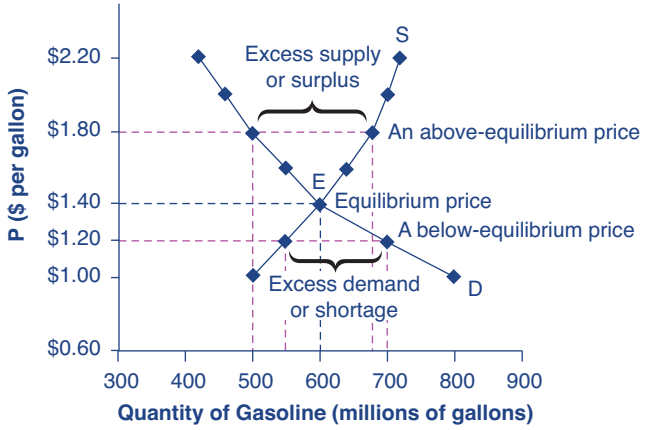
equilibrium quantity: The quantity at which quantity demanded and quantity supplied are equal at a certain price.

equilibrium price: The price where quantity demanded is equal to quantity supplied.

equilibrium: The combination of price and quantity where there is no economic pressure from surpluses or shortages that would cause price or quantity to shift.

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

Imagine, for example, that the price of a gallon of gasoline is above the equilibrium price at $1.80 per gallon. This above-equilibrium price is illustrated by the dashed hori-



Price (per gallon)	Quantity Demanded	Quantity Supplied
$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

EXHIBIT 4-3 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 of 680 exceeds the quantity demanded of 500, so there is excess supply or a surplus. At a price below equilibrium, such as $1.20, quantity demanded of 700 exceeds quantity supplied of 550, so there is excess demand or a shortage.

zontal line at the price of $1.80 in Exhibit 4-3. At this higher price of $1.80, the quantity demanded drops from the equilibrium quantity of 600 to 500 million gallons. This decline in quantity reflects how people and businesses react to the higher price by seeking out ways to use less gasoline, like sharing rides to work, taking public transportation, and avoiding faraway vacation destinations. Moreover, at this higher price of $1.80, the quantity supplied of gasoline rises from the 600 to 680 million gallons, as the higher price provides incentives for gasoline producers to expand their output. At this above-equilibrium price, there is **excess supply**, or a **surplus**; that is, the quantity supplied exceeds the quantity demanded at the given price.

excess supply: When at the existing price, quantity supplied exceeds the quantity demanded; also called a "surplus."

surplus: When at the existing price, quantity supplied exceeds the quantity demanded; also called "excess supply."

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 of gasoline 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, at least some gasoline producers and sellers will be tempted to cut prices, because it is better to sell at a lower price than not to sell at all. Once some sellers start cutting gasoline prices, others will follow so that they won't lose sales to the earlier price-cutters. These price reductions in turn will stimulate a higher quantity demanded. In this way, 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 shown by the dashed horizontal line at this price in Exhibit 4-3. At this lower price, the quantity demanded increases from 600 to 700 million gallons as drivers take longer trips, spend more minutes warming up their car in the driveway in wintertime, stop sharing rides to work, and purchase 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 of gasoline falls from 600 to 550 million gallons. 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.

excess demand: At the existing price, the quantity demanded exceeds the quantity supplied, also called "shortage."

shortage: At the existing price, the quantity demanded exceeds the quantity supplied, also called "excess demand."

Shifts in Demand and Supply for Goods and Services

A demand curve shows how quantity demanded changes as the price rises or falls. A supply curve shows how quantity supplied changes as the price rises or falls. But what happens when factors other than price influence quantity demanded and quantity supplied? For example, what if demand for, say, vegetarian food becomes popular with more consumers? Or what if the supply of, say, diamonds rises not because of any change in price, but because companies discover several new diamond mines? A change in price leads to a different point on a specific demand curve or a supply curve, but a shift in some economic factor other than price can cause the entire demand curve or supply curve to shift.

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. Thus, the implicit assumption behind a demand curve or a supply curve is that no other relevant economic factors are changing. Economists refer to this assumption as ***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. If all else is not held equal, then the demand or supply curve itself can shift.

***ceteris paribus*:** Other things being equal.

An Example of a Shifting Demand Curve

The original demand curve D_0 in Exhibit 4-4 shows at point Q that at a price of $20,000 per car, the quantity of cars demanded would be 18 million. The original demand curve 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, as 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. But now imagine that the economy expands in a way that raises the incomes of many people. As a result of the higher income levels, a **shift in demand** occurs, which means that compared to the original demand curve D_0, a different quantity of cars will now be demanded at every price. On the original demand curve, a price of $20,000 means a quantity demanded of 18 million, but after higher incomes cause an increase in demand, a price of $20,000 leads to a quantity demanded of 20 million, at point S. Exhibit 4-4 illustrates the shift in demand as a result of higher income levels with the shift of the original demand curve D_0 to the right to the new demand curve D_1.

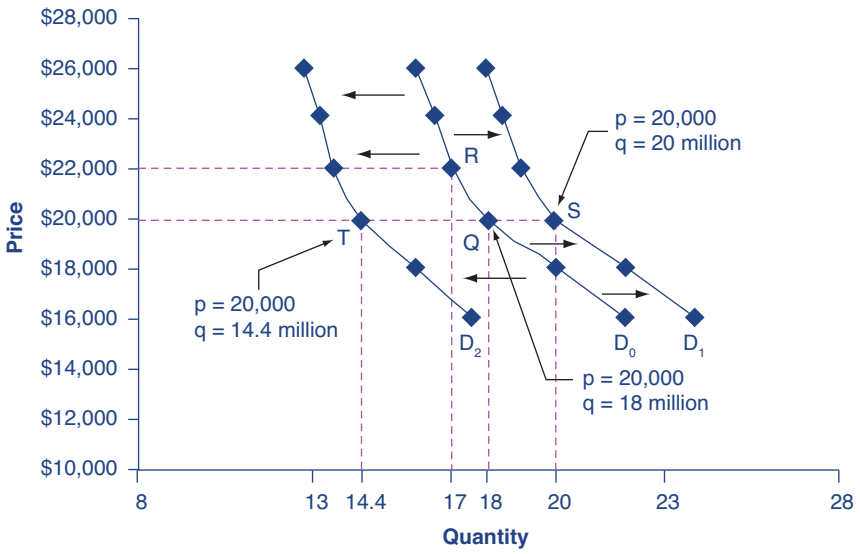
shift in demand: When a change in some economic factor related to demand causes a different quantity to be demanded at every price.

This logic works in reverse, too. Imagine that the economy slows down so that many people lose their jobs or work fewer hours and thus suffer reductions in income. In this case, the shift in demand 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 a decrease in demand; that is, at any given price level, the quantity demanded is now lower. In this example, a price of $20,000 means 18 million are cars sold along the original demand curve, but only 14.4 million cars are sold after demand has decreased, at point T in Exhibit 4-4.

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 captures an overall pattern for the market as a whole.

Factors That Shift Demand Curves

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 or to the left of the original demand curve. Various factors



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

EXHIBIT 4-4
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.

may cause a demand curve to shift: changes in income, changes in population, changes in taste, changes in expectations, and changes in the prices of closely related goods. Let's consider these factors in turn.

A *change in income* will often shift demand curves. A household with a higher income level will tend to demand a greater quantity of goods at every price than a household with a lower income level. For some luxury goods and services, such as expensive cars, exotic spa vacations, and fine jewelry, the effect of a rise in income can be especially pronounced. However, a few exceptions to this pattern do exist. As incomes rise, many people will buy fewer bus tickets and more airplane tickets, less chicken and more steak; they will be less likely to rent an apartment and more likely to own a home; and so on. **Normal goods** are defined as those where the quantity demanded rises as income rises, which is the most common case; **inferior goods** are defined as those where the quantity demanded falls as income rises.

normal goods: Goods where the quantity demanded rises as income rises.

inferior goods: Goods where the quantity demanded falls as income rises.

Changes in the composition of the population can also shift demand curves for certain goods and services. The proportion of elderly citizens in the U.S. population is rising, from 9% in 1960, to 13% in 2010, and to 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.

Changing tastes can also shift demand curves. In the demand for music, for example, 50% of sound recordings sold in 1990 were in the rock or pop music categories. By 2018, rock and pop had fallen to 34% of the total, while sales of rap/hip-hop, religious, and country categories had increased. Tastes in food and drink have changed, too. From 1970 to 2017, the per person consumption of chicken by Americans rose from 40 pounds per year to 92 pounds per year, and consumption of cheese rose from 11 pounds per year

to 39 pounds per year. 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.

Changes in expectations about future conditions and prices can also shift the demand curve for a good or service. 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.

substitutes: Goods that can replace each other to some extent, so that a rise in the price of one good leads to a lower quantity consumed of another good, and vice versa.

The demand curve for one good or service can be affected by *changes in the prices of related goods*. Some goods and services are **substitutes** for others, which means that they can replace the other good to some extent. For example, if the price of cotton rises, driving up the price of clothing, sheets, and other items made from cotton, then some people will shift to comparable goods made from fabrics like wool, silk, linen, and polyester. A higher price for a substitute good shifts the demand curve to the right; for example, a higher price for tea encourages buying more coffee. Conversely, a lower price for a substitute good has the reverse effect.

complements: Goods that are often used together, so that a rise in the price of one good tends to decrease the quantity consumed of the other good, and vice versa.

Other goods are **complements** for each other, meaning that the goods are often used together, so that consumption of one good tends to increase consumption of the other. Examples include breakfast cereal and milk; golf balls and golf clubs; gasoline and sports utility vehicles; and the five-way combination of bacon, lettuce, tomato, mayonnaise, and bread. If the price of golf clubs rises, demand for a complement good like golf balls decreases. 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.

Summing Up Factors That Change Demand

Six factors that can shift demand curves are summarized in Exhibit 4-5. The direction of the arrows indicates whether the demand curve shifts represent an increase in demand or a decrease in demand based on the six factors we just considered. 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. Notice also that in these diagrams, the demand curves are drawn without numerical quantities and prices on the horizontal and vertical axes. The demand and supply model can often be a useful conceptual tool even without attaching specific numbers.

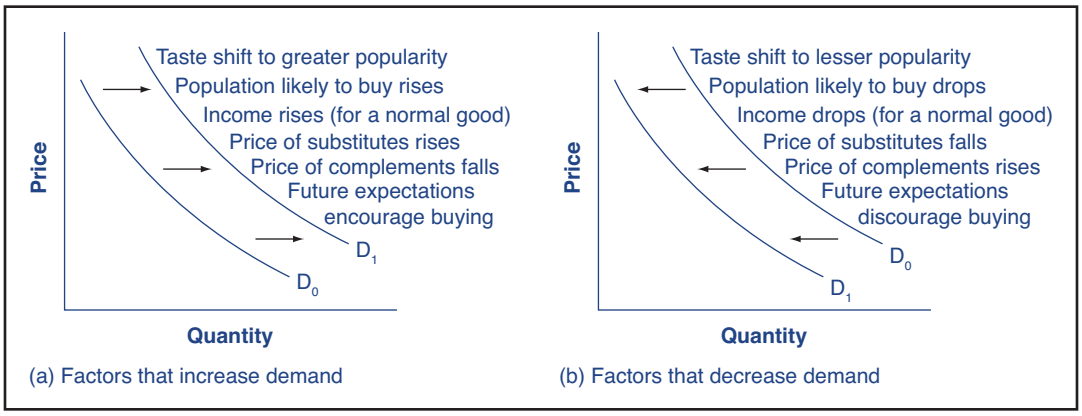


EXHIBIT 4-5 Some Factors That Shift Demand Curves

The left-hand panel *(a)* offers a list of factors that can cause an increase in demand from D_0 to D_1. The right-hand panel *(b)* shows how the same factors, if their direction is reversed, can cause a decrease in demand from D_0 to D_1. For example, greater popularity of a good or service increases demand, causing a shift in the demand curve to the right, while lesser popularity of a good or service reduces demand, causing a shift of the demand curve to the left.

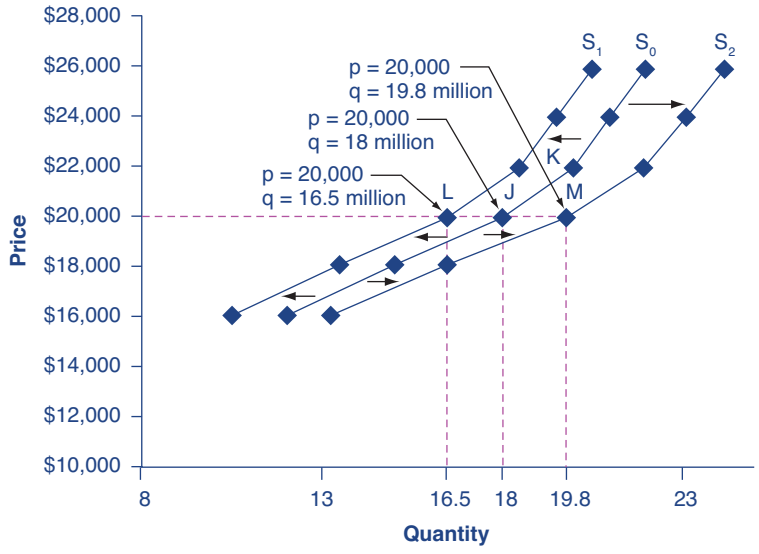
When a demand curve shifts, it will then intersect with a given supply curve at a different equilibrium price and quantity. But we are getting ahead of our story. Before discussing how changes in demand can affect equilibrium price and quantity, we first need to discuss shifts in supply curves.

An Example of a Shift in a Supply Curve

A supply curve shows how quantity supplied will change as the price rises and falls, based on the *ceteris paribus* assumption that no other economically relevant factors are changing. But if other factors relevant to supply do change, then the entire supply curve can shift. Just as a shift in demand is represented by 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 the basic motivation of firms: to earn profits. If a firm faces lower costs of production, while the prices for the output the firm produces remain unchanged, a firm's profits will increase. Thus, when costs of production fall, a firm will supply a higher quantity at any given price for its output, and the supply curve will shift to the right. Conversely, if a firm faces an increased cost 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.

shift in supply: When a change in some economic factor related to supply causes a different quantity to be supplied at every price.

As an example, imagine that supply in the market for cars is represented by S_0 in Exhibit 4-6. The original supply curve, S_0, includes a point with a price of $20,000 and a quantity supplied of 18 million cars, labeled as point J. If the price rises to $22,000 per car, *ceteris paribus*, the quantity supplied will rise to 20 million cars, as shown by point K on the S_0 curve.



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

EXHIBIT 4-6
Shifts in Supply: A Car Example

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_2. Decreased supply means that at every given price, quantity supplied of cars is lower, so that the supply curve shifts to the left from S_0 to S_1.

Now imagine that the price of steel, an important material input in manufacturing cars, rises, so that producing a car has now become more expensive. At any given price for selling cars, car manufacturers will react by supplying a lower quantity. The shift of supply from S_0 to S_1 shows 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, imagine that the price of steel decreases, so that producing a car becomes less expensive. At any given price for selling cars, car manufacturers can now expect to earn higher profits and so 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.

Factors That Shift Supply Curves

A change in any factor that determines what quantity firms are willing to sell at a given price will cause a change in supply. Some factors that can cause a supply curve to shift include: changes in natural conditions, altered prices for inputs to production, new technologies for production, and government policies that affect production costs.

The cost of production for many agricultural products will be affected by *changes in natural conditions*. For example, the area of northern China that typically grows about 60% of the country's wheat output experienced its worst drought in at least 50 years in the second half of 2009. A drought decreases the supply of agricultural products, which means that at any given price, a lower quantity will be supplied; conversely, exceptionally good weather would shift the supply curve to the right.

Goods and services are produced using combinations of labor, materials, and machinery. When *the price of a key input to production changes*, the supply curve is affected. For example, a messenger company that delivers packages around a city may find that buying gasoline is one of its main costs. If the price of gasoline falls, then in the market for messenger services, a higher quantity will be supplied at any given price per delivery. Conversely, a higher price for key inputs will cause supply to shift to the left.

When a firm discovers a *new technology*, so that it can produce at a lower cost, the supply curve will shift as well. For example, 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 was grown with 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 $9 billion per year from producers. There is a wide array of government regulations that require firms to spend money to provide a cleaner environment or a safer workplace. A government subsidy, on the other hand, occurs when the government sends money to a firm directly or when the government reduces the firm's taxes if the firm carries out certain actions. For example, the U.S. government pays more than $20 billion per year directly to firms to support research and development. From the perspective of a firm, 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. However, government subsidies can reduce the cost of production and increase supply.

Summing Up Factors That Change Supply

Weather patterns, changes in the cost of inputs, new technologies, and the impact of government decisions all affect the cost of production for firms. In turn, these factors affect

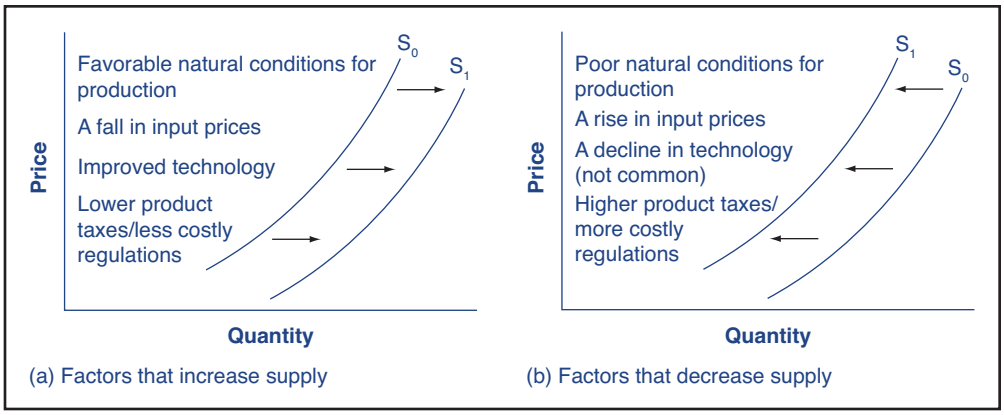


EXHIBIT 4-7
Some Factors That Shift Supply Curves

The left-hand panel *(a)* offers a list of factors that can cause an increase in supply from S_0 to S_1. The right-hand panel *(b)* shows that the same factors, if their direction is reversed, can cause a decrease in supply from S_0 to S_1.

firms' willingness to supply at a given price. Exhibit 4-7 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 along the supply curve for that specific good or service, it does not cause the supply curve itself to shift.

Shifts in Equilibrium Price and Quantity: The Four-Step Process

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 only about four topics: demand, supply, price, and quantity. However, demand and supply are really "umbrella" concepts: demand covers all of the factors that affect demand, and supply covers all of the factors that affect supply. The 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.

To understand how this works, let's begin 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 can analyze this question using a four-step process.

Step 1: Think about what the demand and supply curves in this market looked like before the economic change occurred. Sketch the curves.

Step 2: Decide whether the economic change being analyzed affects demand or supply.

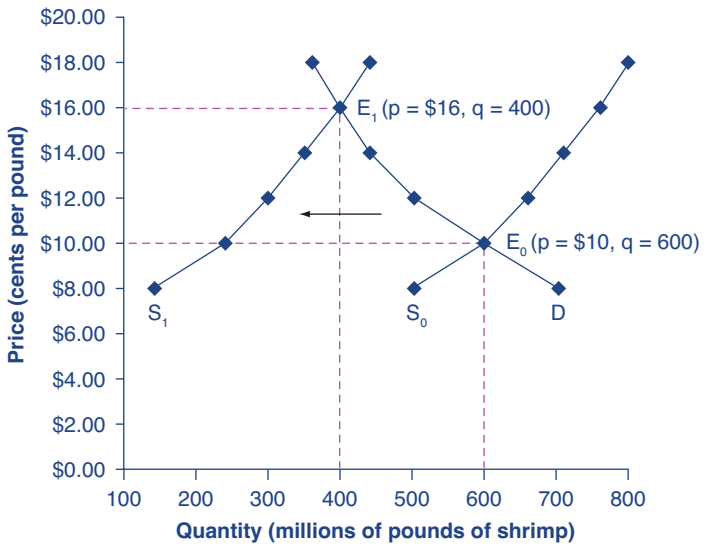
Step 3: Decide whether the effect on demand or supply causes the curve to shift to the right or to the left, and sketch the new demand or supply curve on the diagram.

Step 4: Compare the original equilibrium price and quantity to the new equilibrium price and quantity.

To make this process concrete, let's consider one example that involves a shift in supply and one that involves a shift in demand.

Sick Shrimp

More than 90% of the shrimp consumed in the United States is imported. In 2013, Thailand, Vietnam, and China—three main global shrimp producers—experienced an outbreak of disease that affected their shrimp supplies. How did the shrimp disease affect



Price per Pound	Quantity Supplied in 2008	Quantity Supplied in 2013	Quantity Demanded
$8	500	140	700
$10	600	240	600
$12	660	300	500
$14	710	350	440
$16	760	400	400
$18	800	440	360

EXHIBIT 4-8 Sick Shrimp: The Four-Step Process

Step 1: Draw a demand and supply diagram to show what the market for shrimp looked like before the shrimp disease. The original equilibrium E_0 was $10 per pound, and the original equilibrium quantity was 600 million pounds of shrimp.

Step 2: Did the economic event affect supply or demand? A disease is a natural condition that affects supply.

Step 3: Was the effect on supply an increase or a decrease? Disease reduces the quantity that will be supplied at any given price. The supply curve shifts to the left from S_0 to S_1.

Step 4: Compare the new equilibrium price and quantity to the original equilibrium. At the new equilibrium, E_1, the equilibrium price rose from $10 per pound to $16 per pound, but the equilibrium quantity decreased from 600 million pounds to 400 million pounds. Notice that the equilibrium quantity demanded decreased, even though the demand curve did not move.

the equilibrium quantity and price of shrimp in the United States? Exhibit 4-8 uses the four-step approach to work through this problem.

1. Draw a demand and supply diagram to show what the market for shrimp looked like before the shrimp disease. The original equilibrium E_0 was $10 per pound, and the original equilibrium quantity was 600 million pounds of shrimp.
2. Did the economic event affect supply or demand? A disease is a natural condition that affects supply.
3. Was the effect on supply an increase or a decrease? Disease reduces the quantity that will be supplied at any given price. The supply curve shifts to the left from S_0 to S_1.
4. Compare the new equilibrium price and quantity to the original equilibrium. At the new equilibrium, E_1, the equilibrium price rose from $10 per pound to $16 per pound, but the equilibrium quantity decreased from 600 million pounds to 400 million pounds. Notice that the equilibrium quantity demanded decreased, even though the demand curve did not move.

In short, the outbreak of shrimp disease decreased the supply of imported shrimp in the United States. The result was a lower equilibrium quantity of shrimp bought and sold in the market at a higher price.

Sand and Hydraulic Fracturing

The U.S. economy used about 102 million tons of industrial sand and gravel in 2015, which is roughly four times as much as a decade earlier. In addition, the price rose from $18.30/ton in 2003 to $47.08/ton in 2015. What happened? This kind of sand, also called "silica," is an input in products such as concrete and asphalt pavement, and it is also present in paint, paper, plastics, and glass. However, this sand is also used in hydraulic

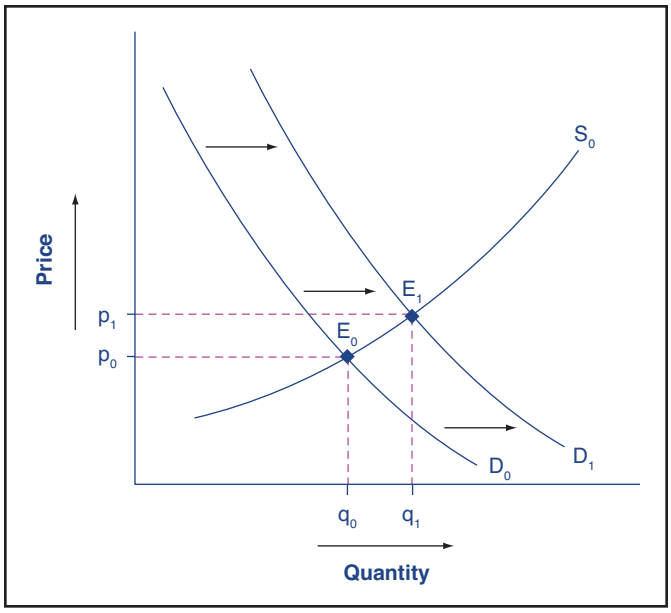


EXHIBIT 4-9 The Market for Sand: A Four-Step Analysis

Step 1: Draw a demand and supply diagram to illustrate what the market for sand looked like before the fracking boom. The demand curve D_0 and the supply curve S_0 show the original relationships.

Step 2: Will the change described affect supply or demand? The more widespread use of hydraulic fracturing technology will affect the demand for sand, which is used in that process.

Step 3: Will the effect on demand be positive or negative? The growth of fracking will tend to mean a higher quantity demanded of the product, sand, at every given price, causing the demand curve for sand to shift to the right from D_0 to D_1.

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

fracturing, a method of extracting oil and natural gas, and use of this method expanded substantially in recent years. When oil and gas prices were high, "fracking" accounted for well over half of U.S. consumption of industrial sand. How could increases in fracking affect the demand for sand? Exhibit 4-9 illustrates the four-step analysis.

1. Draw a demand and supply diagram to illustrate what the market for sand looked like in the year before the fracking boom. In Exhibit 4-9, the demand curve D_0 and the supply curve S_0 show the original relationships. In this case, the analysis is performed without specific numbers on the price and quantity axes.
2. Did the change described affect supply or demand? The widespread use of hydraulic fracturing technology, encouraged by a large rise in the price of oil and natural gas during the first decade of the 2000s, will affect demand for sand.
3. Was the effect on demand an increase or a decrease? The changes meant a higher quantity demanded of the product, sand, at every given price, causing the demand curve for sand to shift right to the new demand curve D_1.
4. Compare the new equilibrium price and quantity at E_1 to the original equilibrium price and quantity at E_0. The new equilibrium E_1 occurs at a higher quantity and a higher price than the original equilibrium E_0.

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 of 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.

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. But as a practical matter, 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. Indeed, even as they are moving toward one new equilibrium, prices are often then pushed by another change in demand or supply toward another equilibrium.

Price Ceilings and Price Floors in Markets for Goods and Services

Controversy often surrounds the prices and quantities that are established by demand and supply. After all, every time you buy a gallon of gasoline, pay the rent for your apartment, or pay the interest charges on your credit card, it's natural to wish that the price

CLEARING IT UP

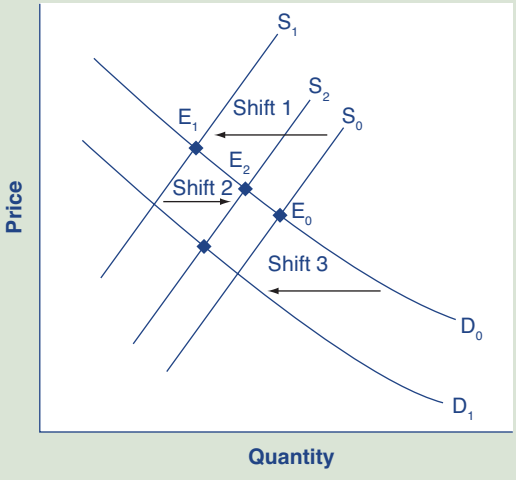
Shifts of Demand or Supply versus Movements along a Demand or Supply Curve

One common mistake in applying the demand and supply framework is to confuse the shift of a demand or a supply curve with the 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's clear that a drought reduces supply, so I'll shift back the supply curve, as in the shift from the original supply curve S_0 to S_1 shown on the diagram (call this Shift 1). So 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 shown by the shift from S_1 to S_2 on the diagram (shown as Shift 2), so that the equilibrium now moves from E_1 to E_2. But the higher price 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."

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 of a quantity and a higher equilibrium price. 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 cause the demand or supply curve for that good to shift.



had been at least a little lower. Every time a restaurant sells a meal, a department store sells a sweater, or a farmer sells a bushel of wheat, it's natural for the profit-seeking seller to wish that the price had been higher. 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 provided by these laws to control prices, in ways that will often lead to undesirable costs and consequences. Alternative policy tools can often achieve the desired goals of price control laws, while avoiding at least some of the costs and trade-offs of such laws.

Price Ceilings

Price controls are laws that the government enacts to regulate prices. Price controls come in two flavors. A **price ceiling** keeps a price from rising above a certain level, while a **price floor** keeps a price from falling below a certain level. This section uses the demand and supply framework to analyze price ceilings; the next section turns to price floors.

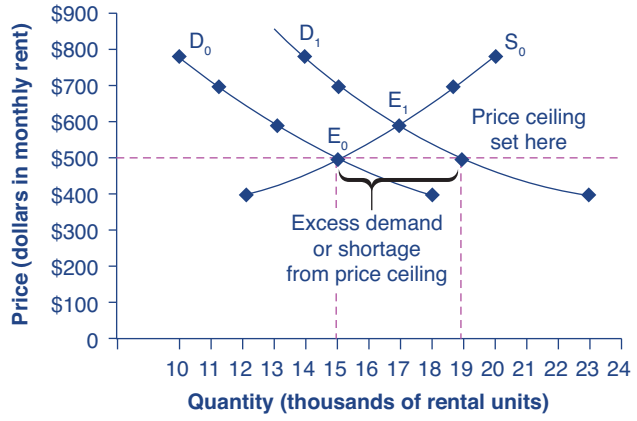
price controls: Government laws to regulate prices.

price ceiling: A law that prevents a price from rising above a certain level.

price floor: A law that prevents a price from falling below a certain level.

In many markets for goods and services, demanders outnumber suppliers. There are more people who buy bread than companies that make bread; more people who rent apartments than landlords; more people who purchase prescription drugs than companies that manufacture such drugs; more people who buy gasoline than companies that refine and sell gasoline. Consumers, who are also potential voters, sometimes flex enough political strength to push for a law to hold down the level of a certain price. In some cities, for example, renters have pressed political leaders to pass rent control laws, a form of price ceiling that might require that rents can only be raised by a certain maximum percentage each year.

Rent control can become a politically hot topic when rents begin to rise rapidly. Rents might rise for many reasons. 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. Changes of this sort can cause a change in the demand for rental housing, as illustrated in Exhibit 4-10. 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 shown by the data in the table 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.



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

EXHIBIT 4-10 A Price Ceiling Example—Rent Control

The original intersection of demand and supply occurs at E_0. Demand shifts from D_0 to D_1. The new equilibrium would be at E_1—except that a price ceiling prevents the price from rising. Because the price doesn't change, the quantity supplied remains at 15,000. However, after the change in demand, the quantity demanded rises to 19,000. There is excess demand, also called a shortage.

What's a Price Bubble? A Story of Housing Prices

The average price of a U.S. single-family home rose about 1–3% per year in the first half of the 1990s, 3–5% per year in the second half of the 1990s, 7–8% per year in the early 2000s, and more than 10% per year from late 2004 to early 2006.

Although no one seriously expected price increases of 10% per year to continue for long, what happened next was still a shock. Certain metropolitan areas or states had seen declines in housing prices from time to time, but there had not been a nationwide decline in housing prices since the Great Depression of the 1930s. However, housing prices started falling in 2006, and through much of 2008 and 2009, the national average of housing prices fell at a rate of 4–5% per year. Of course, these national averages understate the experience of certain parts of the country where both the boom and the bust were much larger.

Economists refer to this chain of events as a price "bubble." Remember that one possible reason for demand to shift is expectations about the future. If many people expect that housing prices are going to rise in the future, demand for housing will shift to the right—thus helping the prediction of higher prices come true. For a time, a cycle of expecting higher prices, increases in demand, and resulting higher prices can be self-reinforcing. But this process cannot last forever. At some unpredictable time, potential buyers recognize that the expectations of ever-higher future prices are unrealistic, at which point the expectation that future prices will stop rising or start falling causes demand to shift back in the other direction, and the price bubble deflates. Price bubbles are not just observed in housing: for example, they are also seen in markets for collectible items and in stock markets.

The bursting of the price bubble in housing—which happened in many countries around the world, not just the United States—caused severe economic difficulties. Those who owned homes watched the value of this asset decline. Some of those who borrowed money to buy a house near the peak of the bubble found a few years later, after the bubble had burst, that what they owed to the bank was much more than the house was worth. When many people began to default on their mortgage loans, banks and other financial institutions then faced losses. The bursting of the price bubble in housing helped to trigger the global economic slowdown that started in late 2007 and continued until 2009.

Long-time apartment dwellers will dislike these price increases. They may argue, "Why should *our* rents rise because a lot of newcomers want to move in?" The current apartment dwellers are also voters, and they may elect local politicians who pass a price ceiling law that limits how much rents can rise.

For simplicity, let's assume that a rent control law is passed to keep the price at the original equilibrium of $500 for a typical apartment. In Exhibit 4-10, 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 have not vanished. At that price ceiling, the quantity demanded exceeds the quantity supplied: that is, at a price of $500 the quantity supplied remains at the same 15,000 rental units, but the quantity demanded is 19,000 rental units. Thus, people who would like to rent in this area are knocking on the doors of landlords, searching for apartments. A situation of excess demand, also called a shortage, results when people are willing to pay the market price but cannot purchase (or in this case rent) what they desire.

Rent control has been especially popular in wartime and during times of high inflation. New York City, the most prominent U.S. city that has imposed rent control laws for a long period, put rent control in place as a "temporary" measure during World War II. Rent control was also especially popular during the 1970s, when all prices in the U.S. economy were rising rapidly as part of an overall process of inflation. By the mid-1980s, more than 200 American cities, with about 20% of the nation's population, had rent control laws. But in the last 25 years or so, the political pendulum was mostly swinging against rent control. More than 30 states adopted laws or constitutional amendments banning rent control outright. In many cities that kept some form of rent control, the focus of the law shifted from trying to hold rents below the equilibrium price to offering ways for resolving disputes between tenants and landlords, like disagreements about maintenance, pets, and noise. However, the last few years have seen a modest resurgence of rent control in some cities where prices for rental apartments have risen most.

CLEARING IT UP

Price Ceilings and Floors Do Not Change Demand or Supply

Neither price ceilings nor price floors cause demand or supply to change. Remember, changes in price don't cause demand or supply to change. Price ceilings and price floors can cause a different choice of quantity demanded along a demand curve, but they don't move the demand curve. Price controls can cause a different choice of quantity supplied along a supply curve, but they don't shift the supply curve.

Price ceilings are often proposed for other products, too. For example, price ceilings to limit what producers can charge have been proposed in recent years for prescription drugs, on doctor and hospital fees, the charges made by some automatic teller bank machines, and auto insurance rates. Many low-income countries around the world have also imposed price ceilings on basic items like bread or energy products. In the early 2000s, the government of the African country of Zimbabwe tried to help its ordinary citizens by placing ceilings on the prices of ordinary household items like bread, wheat, and cooking oil. But many producers of these items, faced with the low prices, went out of business. More recently, Venezuela tried a similar policy with similar results. The goal of the price ceiling had been to keep necessities affordable, but the result was that the quantity of the products declined and shortages occurred.

Price ceilings are enacted in an attempt to keep prices low for those who demand the product. But 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.

Price Floors

Price floors are enacted when discontented sellers, feeling that prices are too low, appeal to legislators to keep prices from falling. A price floor is the lowest legal price that can be paid in markets for goods and services, labor, and financial capital. Price floors are sometimes called "price supports" because they prevent a price from falling below a certain level.

Around the world, many countries have passed laws to keep farm prices higher than they otherwise would be. In the annual budget of the European Union, roughly 40% of all spending late in 2014—more than $60 billion per year—was used to keep prices high for Europe's farmers. Thanks to this policy, the prices received by European farmers for such agricultural staples as wheat, barley, rice, milk, and beef have stayed substantially above the price prevailing in the world market for decades.

Exhibit 4-11 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 p_f shown by the dashed horizontal line in the diagram. The result is a quantity supplied of Q_S in excess of the quantity demanded Q_d. When quantity supply exceeds quantity demanded, then a situation of excess supply exists, also called a surplus. 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. Numerous proposals have been offered for reducing farm subsidies. But in many countries, political support for subsidies for farmers—and indirectly, for what is viewed as the traditional rural way of life—remains strong.

CLEARING IT UP

When Floors Are Higher Than Ceilings

In economics, (price) ceilings often appear graphically lower than (price) floors. The reason is that binding price ceilings are below the equilibrium level, stopping the price from rising, and binding price floors are above the equilibrium level, stopping the price from falling. Thus, above-equilibrium price floors are higher than below-equilibrium price ceilings.

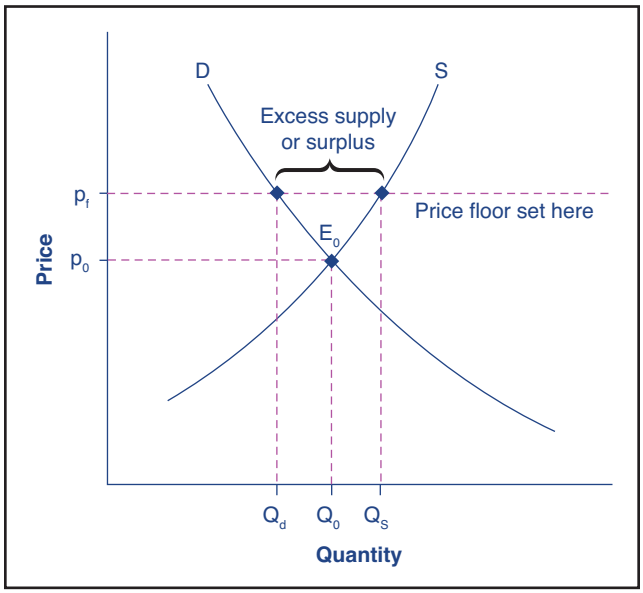


EXHIBIT 4-11 The European Wheat Prices: A Price Floor Example

The intersection of demand D and supply S would be at the equilibrium point E_0. However, a price floor set at p_f holds the price above E_0 and prevents it from falling. The result of the price floor is that the quantity supplied Q_s exceeds the quantity demanded Q_d. There is excess supply, also called a surplus.

Responses to Price Controls: Many Margins for Action

Although a government can set price floors or price ceilings, such rules often have unintended consequences. The focus of the discussion so far has been on reactions that take the form of changes in quantity demanded or quantity supplied, and thus on understanding why price ceilings commonly lead to shortages and price floors lead to surpluses. However, buyers and sellers in real-world markets have many other ways in which they can react to price controls. The ability of households and firms to react in a variety of ways to government rules is called the problem of "many margins for action."

black market: An illegal market that breaks government rules on prices or sales.

One alternative reaction occurs when buyers and seller decide to break the government rules on prices or sales, which is referred to as a **black market**. Consider a landlord who owns rent-controlled property. Suppose that although the law dictates the cap on the rent that the landlord can charge, a potential tenant is willing to pay more than the rent control law allows to live in the apartment. If this "extra rent" is paid in cash, then who will know?

A second margin for action is "side payments," which are additional payments that are made along with the actual price paid. In New York City, with its long history of rent control, landlords sometimes devise innovative charges like a "nonrefundable cleaning deposit" or a "nonrefundable key deposit." Such charges can have the effect of making the tenant pay more than the actual rent.

Price Controls of 1776

During the American Revolution, a number of states imposed price ceilings on many goods. After Rhode Island passed price control laws in 1776, the city of Providence reported on the effects to the state legislature in 1777:

> [The effect] is so intricate, variable, and complicated, that it cannot remain any time equitable. . . . It was made to cheapen the articles of life, but it has in fact raised their prices, by producing an artificial and in some respects a real scarcity. It was made to unite us in good agreement respecting prices; but hath produced animosity, and ill will between town and country, and between buyers and sellers in general. It was made to bring us up to some equitable standard of honesty . . . but hath produced a sharping set of mushroom peddlers, who adulterate their commodities, and take every advantage to evade the . . . act, by quibbles and lies.

Price control laws are often popular in the short run, because they look like an easy fix, but they become less popular over time as shortages occur, social tensions arise, and efforts to evade the laws gain force. The problems noted by the citizens of Providence, Rhode Island, in 1777 apply today as they did more than two centuries ago.

A third margin for action involves quality adjustment. In the case of rent control, a landlord may keep the rent low, but put off needed maintenance or the installation of new appliances. The result is a lower-priced apartment—but also a lower-quality apartment.

A fourth margin for action involves shifting who is involved in the transaction. In cities with rent control, it isn't unusual for a tenant living in a rent-controlled apartment not to move out officially; instead, the tenant sublets the apartment to someone else. In this case, the original tenant pays the rent-controlled rate but charges the market rate to the new renter and pockets the difference.

Those who favor price floors and price ceilings are often quite aware of the actions that can circumvent the underlying purpose of price controls. Thus, supporters of price controls also favor rules that will include penalties for black markets, make side payments illegal, require certain quality levels, and prohibit shifts in who is involved in the transaction. However, establishing rules or laws that will limit all of the alternative margins for action is like trying to block a flowing stream with your fingers. Shutting down the many margins for action by which citizens and firms respond to price controls is much easier said than done.

Policy Alternatives to Price Ceilings and Price Floors

The economic analysis of how price ceilings can create shortages and price floors create surpluses can be disheartening. If you want to pursue a policy goal of assuring that people have a sufficient quantity of affordable housing, but rent controls are just price ceilings that cause housing shortages, what alternative policy can you advocate? If you want to pursue a policy goal of supporting farmers, but farm price supports lead to storehouses of surplus grain rotting at high cost to taxpayers and consumers, then what alternative policy can you advocate? The same demand and supply model that shows that price ceilings and price floors often have unintended, undesirable consequences of creating surpluses and shortages can also suggest alternate public policies that do not have these same trade-offs.

Let's return to the issue of rent control. If the goal is to have an expanded supply of affordable housing, then a rightward shift in a demand curve, a supply curve, or both as shown in Exhibit 4-12, can accomplish this goal. A shift to the right in the supply of affordable housing from S_0 to S_1, for example, might be achieved if a government grants subsidies to builders who construct apartment buildings that have relatively smaller rental units, which will have a more affordable price in the market. This step taken alone would cause a shift to the right from the original equilibrium, E_0, to the new equilibrium, E_1, and would increase the quantity of housing from q_0 to q_1. A shift to the right in the demand curve from D_0 to D_1 might be achieved by giving a subsidy to low-income renters, perhaps

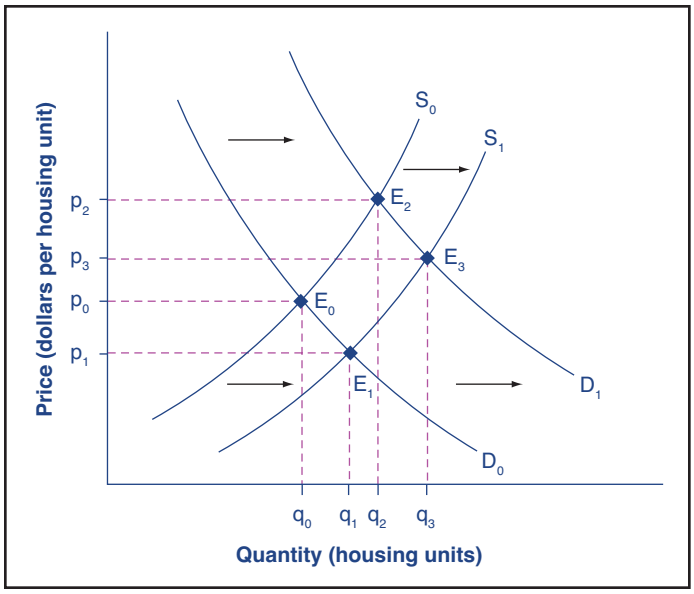


EXHIBIT 4-12 Policies for Affordable Housing: Alternatives to Rent Control

The original equilibrium is the intersection of demand D_0 and supply S_0 at E_0. Providing subsidies to low-income buyers of housing will shift the demand curve from D_0 to D_1, leading to a new equilibrium at E_2. Alternatively, a policy of providing subsidies to builders of affordable housing would shift the supply curve from S_0 to S_1, leading to a new equilibrium at E_1. Undertaking both demand-side and supply-side policies would move the market to equilibrium E_3, at the intersection of the new demand curve D_1 and the new supply curve S_1. As drawn here, both of these policies will increase the equilibrium quantity of affordable housing. An increase in demand will also raise the price of affordable housing, but as long as the subsidy received by buyers is larger than the higher price, buyers will not be adversely affected by the higher price that occurs from an increase in demand.

in the form of cash or a voucher that the renters could use to pay some of the rent, so that low-income renters could then have more to spend on housing. This step taken alone would cause a shift to the right from the original equilibrium, E_0, to the new equilibrium, E_2, and would increase the quantity of affordable housing from q_0 to q_2. Instituting *both* sets of policies would shift supply from S_0 to S_1, demand from D_0 to D_1, the equilibrium from the original E_0 to E_3, and the quantity of affordable housing from q_0 to q_3.

Any combination of these policies is likely to be more useful in expanding affordable housing than rent control, because these policies tend to increase the quantity of affordable housing, whereas rent control tends to decrease it. Moreover, these alternative policies sidestep many of the problems that arise when suppliers and demanders react to price controls.

Similarly, there are a number of alternative policies to support farmers or rural areas that do not involve setting price floors for crops. For example, the government could provide income directly to farmers, especially to small-scale farmers with lower incomes. The government might also assist rural economies in many other ways: establishing new branches of state colleges and universities in agricultural areas, creating parks or nature preserves that might attract tourists, supporting research into new methods of producing and using local crops to help the local farmers stay ahead, helping to build transportation links to rural areas, and subsidizing high-speed Internet cable connections across rural areas or wireless phone service. All of these alternative policies would help rural communities while avoiding the problem of price floors, because these alternative policies don't encourage farmers to produce an excess supply of surplus food.

With alternative policies readily available, why do governments enact price floors and price ceilings? One reason is that in public policy debates over price controls, people often don't take into account the unintended but predictable trade-offs. Another reason

is that government sometimes views laws about price floors and ceilings as having zero cost, while giving subsidies to demanders or suppliers requires a government to collect taxes and spend money. The point here is not to endorse every proposal for using targeted subsidies or tax breaks to change demand and supply. Each policy proposal must be evaluated according to its own costs and benefits. But before reaching for the seemingly easy policy tool of price controls, with their predictable and undesired consequences and trade-offs, it is wise to consider alternative policies to shift demand and supply so as to achieve the desired new market equilibrium.

Supply, Demand, and Efficiency

In the market equilibrium, where the quantity demanded equals quantity supplied, nothing is wasted. No excess supply sits unsold, gathering dust in warehouses. No shortages exist that cause people to stand in long lines or rely on political connections to acquire goods—alternatives that waste time and energy. All those who wish to purchase or sell goods at the equilibrium market price are able to purchase or sell the quantity that they desire, as movements of the equilibrium price bring quantity demanded and supplied into balance.

The familiar demand and supply diagram holds within it the concept of economic efficiency, which was introduced in Chapter 2. To economists, an efficient outcome is one where it is impossible to improve the situation of one party without imposing a cost on someone else. Conversely, if a situation is inefficient, it becomes possible to benefit at least one party without imposing costs on others. The definition of productive efficiency in Chapter 2 was that the economy was producing without waste and getting all it could out of its scarce resources: specifically, it was impossible to get more of good A without a reduction in good B. 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.

Consumer Surplus, Producer Surplus, Social Surplus

Consider the example of a market for portable music devices shown in Exhibit 4-13. The equilibrium price is $80, and the equilibrium quantity is 28 million. To see the benefits received by 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 portable music player. For example, point J shows that if the price was $90, the quantity demanded of the portable music player would have been 20 million. Those consumers who would have been willing to pay $90 for a portable music player 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. Remember, the demand curve traces out the 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 between the market price and the segment of the demand curve above equilibrium.

consumer surplus: The benefit consumers receive from buying a good or service, measured by what the individuals would have been willing to pay minus the amount that they actually paid.

The equilibrium price also benefits producers. The supply curve shows the quantity that firms are willing to supply at each price. For example, point K on Exhibit 4-13 illustrates that at a price of $40, firms would still have been willing to supply a quantity of 14 million. Those producers who would have been willing to supply the portable music players at a price of $40, but who were instead able to charge the equilibrium price of $80, clearly received a benefit. **Producer surplus** is the amount that a seller is paid for a good minus the seller's actual cost. In Exhibit 4-13, 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.

producer surplus: The 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.

Social surplus is the sum of consumer surplus and producer surplus. In Exhibit 4-13, social surplus would thus be shown as the area F + G. Social surplus is larger at equilibrium quantity and price than it would be at any other quantity. At the efficient level of output, it is impossible to increase consumer surplus without reducing producer surplus, and it is impossible to increase producer surplus without reducing consumer surplus.

social surplus: The sum of consumer surplus and producer surplus.

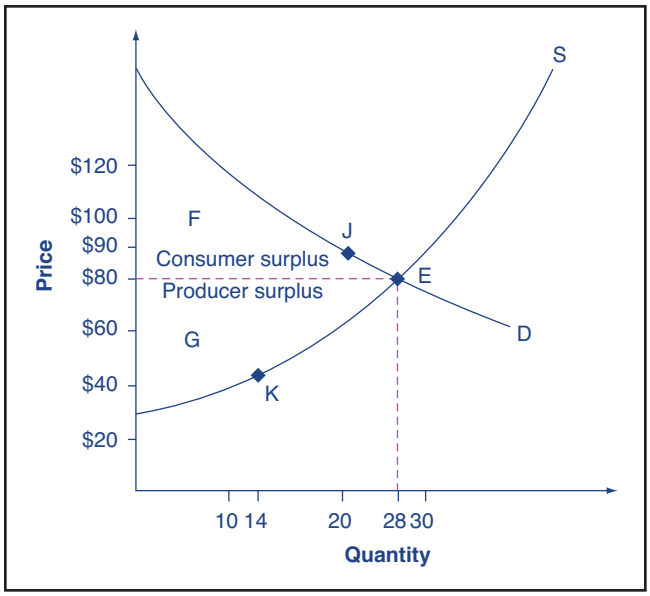


EXHIBIT 4-13 Consumer and Producer Surplus

The 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. For example, 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. But those consumers only needed to pay the equilibrium price of $80. The 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 $40, firms would have been willing to supply a quantity of 14 million. However, in this market those firms could receive a price of $80 for their production. The sum of consumer surplus and producer surplus—that is, F + G—is called social surplus.

Inefficiency of Price Floors and Price Ceilings

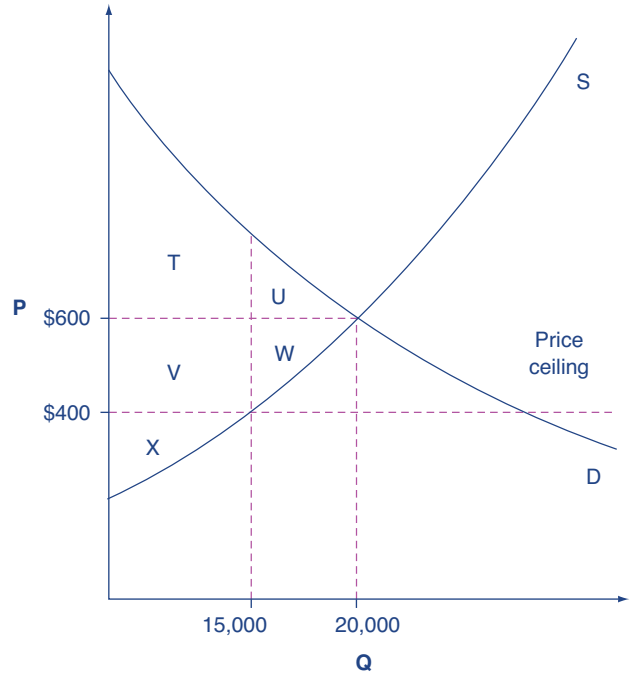
The imposition of a price floor or a price ceiling will prevent a market from adjusting to its equilibrium price and quantity, and thus will create an inefficient outcome. But there is an additional twist here. Along with creating inefficiency, price floors and ceilings will also transfer some consumer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

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 Exhibit 4-14*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 a quantity of 15,000. As a result, two changes occur. First, an inefficient outcome occurs, and the total social surplus is reduced.

deadweight loss: The loss in social surplus that occurs when a market produces an inefficient quantity.

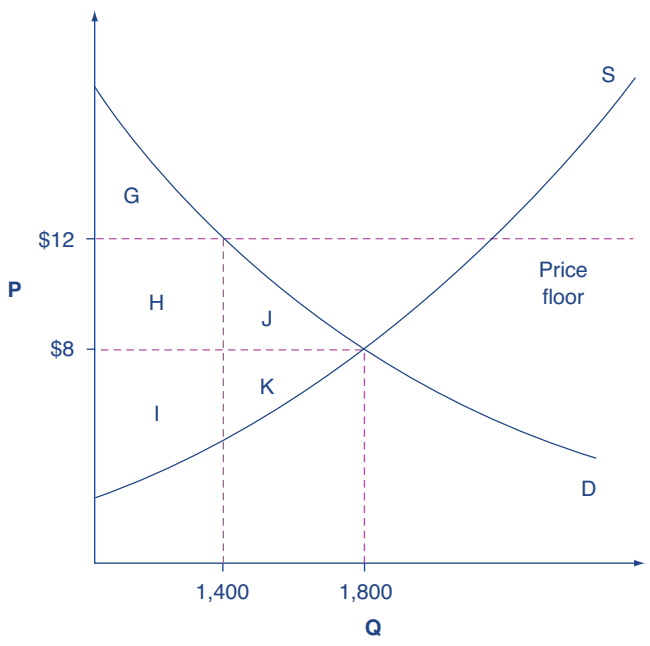
Deadweight loss is the name for the loss in social surplus that occurs when the economy produces at an inefficient quantity. In Exhibit 4-14*a*, the deadweight loss is the area U + W. When deadweight loss exists, it is possible for both consumer and producer surplus to increase, in this case because the price control is blocking some suppliers and demanders from transactions that 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.

For the case of a price floor shown in Exhibit 4-14*b*, envision a situation where a city has several movie theaters that are all losing money. The current equilibrium is a price of $8 per movie, 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 the-



(a) Reduced social surplus from a price ceiling

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. In effect, the price ceiling transfers the surplus V from producers to consumers, but also causes deadweight loss in social surplus of U + W.



(b) Reduced social surplus from a price floor

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. In effect, the price floor causes the area H to be transferred from consumer to producer surplus, but also causes a deadweight loss in social surplus of J + K.

EXHIBIT 4-14 Efficiency and Price Floors and Ceilings

aters will go out of business, thus 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 create 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, or which companies will be allowed to process the remaining supply, or which supermarkets in which cities will receive a certain quantity of 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, demand and supply is the primary social mechanism for answering the basic questions about what is produced, how it is produced, and for whom it is produced.

Key Concepts and Summary

1. 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** points out that a higher price typically leads to a lower quantity demanded.
2. 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** points out that a higher price typically leads to a higher quantity supplied.
3. 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.
4. 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.
5. Economists often use the ***ceteris paribus*** or "other things being equal" assumption, that while examining the economic impact of one event, all other factors remain unchanged for the purpose of the analysis.
6. 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.
7. Factors that can shift the supply curve for goods and services, causing a different quantity to be supplied at any given price, include natural conditions, input prices, changes in technology, and government taxes, regulations, or subsidies.
8. When using the supply and demand framework to think about how an event will affect the equilibrium price and quantity, proceed through four steps: (a) sketch a supply and demand diagram to think about what the market looked like before the event; (b) decide whether the event will affect supply or demand; (c) decide whether the effect on supply or demand is negative or positive, and draw the appropriate shifted supply or demand curve; (d) compare the new equilibrium price and quantity to the original ones.
9. **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.
10. Price floors and price ceilings often lead to unintended consequences because buyers and sellers have many margins for action. These margins include **black markets**, side payments, quality adjustments, and shifts in who is involved in the transaction.
11. Policies that shift supply and demand explicitly, through targeted subsidies or taxes, are often preferable to policies that attempt to set prices because they avoid the shortages, surpluses, and other unintended consequences that price ceilings and floors typically produce.
12. **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 the loss in total surplus that occurs when the economy produces at an inefficient quantity.

Key Terms

Demand, p. 54
Quantity demanded, p. 54
Law of demand, p. 54
Demand schedule, p. 54
Demand curve, p. 54
Supply, p. 55
Quantity supplied, p. 55
Law of supply, p. 55
Supply schedule, p. 55
Supply curve, p. 55
Equilibrium quantity, p. 56
Equilibrium price, p. 56
Equilibrium, p. 56
Excess supply, p. 57
Surplus, p. 57
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Price ceiling, p. 67
Price floor, p. 67
Black market, p. 70
Consumer surplus, p. 73
Producer surplus, p. 73
Social surplus, p. 73
Deadweight loss, p. 74

Review Questions

1. In the economic view, what determines the level of prices?
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?
4. What does an upward-sloping supply curve mean about how sellers in a market will react to a higher price?
5. Will supply curves have the same shape in all markets?
6. What is the relationship between quantity demanded and quantity supplied at equilibrium?
7. How can you locate the equilibrium point on a demand and supply graph?
8. When analyzing a market, how do economists deal with the problem that many factors that affect the market are changing at the same time?
9. If the price is above the equilibrium level, would you predict excess supply or excess demand? If the price is below the equilibrium level, would you predict a shortage or a surplus?
10. Explain why a price that is above the equilibrium level will tend to fall toward equilibrium. Explain why a price that is below the equilibrium level will tend to rise toward the equilibrium.
11. Name some factors that can cause a shift in the demand curve in markets for goods and services.
12. Does a price ceiling attempt to make a price higher or lower?
13. How does a price ceiling set below the equilibrium level affect quantity demanded and quantity supplied?
14. Does a price floor attempt to make a price higher or lower?
15. How does a price floor set above the equilibrium level affect quantity demanded and quantity supplied?
16. Make a list of ways that buyers and sellers may respond to price ceilings and price floors, other than changes in quantity.
17. Why might economists commonly prefer public policies that shift demand and/or supply rather than imposing price ceilings or price floors?
18. What's the difference between demand and quantity demanded?
19. Name some factors that can cause a shift in the supply curve in markets for goods and services.
20. Is supply the same thing as quantity supplied? Explain.
21. What is consumer surplus? How is it illustrated on a demand and supply diagram?
22. What is producer surplus? How is it illustrated on a demand and supply diagram?
23. What is total surplus? How is it illustrated on a demand and supply diagram?
24. What is the relationship between total surplus and economic efficiency?
25. What is deadweight loss?