it to shift. Because these factors are not the price of the good itself, they are called *nonprice determinants*, or simply, *demand shifters*.

A **change in demand** is an increase (rightward shift) or a decrease (leftward shift) in the quantity demanded at every possible price. If ceteris paribus no longer applies, we consider five major nonprice determinants that can shift the demand curve:

1. Number of Buyers
2. Tastes and Preferences
3. Income
4. Expectations of Buyers
5. Prices of Related Goods

Number of Buyers

Look back at Exhibit 2 and imagine the impact of adding more individual demand curves to the individual demand curves of Fred and Mary. At all possible prices, there would be additional quantity demanded by the new customers, and the market demand curve for T-shirts shifts rightward (an increase in demand). So, for example, population growth might increase the number of buyers and shift the demand curve rightward while trade restrictions imposed by other nations might decrease the number of buyers and shift the demand curve leftward.

Tastes and Preferences

A favorable or unfavorable change in consumer tastes or preferences means more or less of a product is demanded at each possible price. Fads, fashions, advertising, and new products can influence consumer preferences to buy a particular good or service. Beanie Babies, for example, became the rage in the 1990s, and the demand curve for these products shifted to the right, but once people tired of them, demand decreased, shifting the demand curve leftward. More recently, the COVID-19 pandemic decreased the demand for in-person

health clubs and increased the demand for in-home exercise equipment such as Peloton bikes.

Income

It will likely come as no surprise that changes in income affect demand. But whether a change in income causes the demand for a product to increase or decrease depends on the type of good. There are two possible categories of goods related to changes in income and changes in demand:

(1) normal goods and

(2) inferior goods.

For many goods and services, an increase in income causes buyers to purchase more at any possible price. A **normal good** is any good for which there is a direct relationship between changes in income and its demand curve. As buyers receive higher incomes, the demand curve shifts rightward for such *normal goods* as cars, steaks, vintage wine, cleaning services, and T-shirts. A decline in income has the opposite effect, and the demand curve shifts leftward.

A rise in income can, however, result in reduced purchases of a good or service at any possible price. An **inferior good** is any good for which there is an inverse relationship between changes in income and its demand curve. This might happen with such *inferior goods* as generic brand products, Spam, discount clothes, and used cars. Instead of buying these inferior goods, consumers with higher incomes buy brand-name products, steaks, designer clothes, or new cars. Conversely, a fall in income causes the demand curve for inferior goods to shift rightward.

Expectations of Buyers

What is the effect on demand in the present when consumers anticipate future changes in prices, incomes, or availability? Consider what happens if a war breaks out in the Middle East. Expectations that there will be a shortage of gasoline induce consumers to say “fill ’er up” at every opportunity, and demand

increases today. Now consider what happens if students learn that the prices of the textbooks for several courses they plan to take next semester will double soon. Their likely response is to buy now, which causes an increase in the demand curve for these textbooks today.

Prices of Related Goods

Suppose you are deciding how much coffee to buy for a week. Your decision will likely be influenced not just by the price of coffee, but by the price of goods related to coffee such as tea, which you might drink *instead of* coffee, or cream, which you might consume *with* your coffee.

A **substitute good** competes with another good for consumer purchases. In our example, an increase in the price of tea will, as we know from the law of demand, result in a decrease in the quantity of tea being purchased. How will this decrease in the consumption of tea impact the demand for coffee? Some consumers will substitute coffee for tea and the demand for coffee will increase, shifting the entire demand curve for coffee to the right. As you can see, then, there is a direct relationship between a price change for one good (higher price of tea) and the demand for its "competitor" good (higher demand for coffee).

A **complementary good** is jointly consumed with another good. In our example, an increase in the price of cream will, as we know from the law of demand, result in a decrease in the quantity of cream being purchased. How will this decrease in cream consumption impact the demand for coffee? Some consumers who put cream in their coffee will cut back on their coffee consumption, shifting the entire demand curve for coffee to the left. As you can see, then, there is an inverse relationship between a price change for one good (higher price of cream) and the demand for its "go together" good (coffee).

It is important to be clear about our use of the term "nonprice" determinant. The law of demand refers to changing the price of the product in question, that is, changing the price of the good that is on the horizontal axis, coffee in our example. Changing the price of any other product, tea or cream in our example,

is considered changing a “nonprice” determinant because it refers to changing something other than the price of the product on the horizontal axis.

Exhibit 3 summarizes the relationship between changes in the nonprice determinants of demand and the demand curve, accompanied by examples.

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Exhibit 3 Nonprice Determinants of Demand

Nonprice Determinant of Demand	Relationship to Changes in Demand Curve	Shift in the Demand Curve	Examples
1. Number of buyers	Direct		• Immigration from Mexico increases the demand for Mexican food products in grocery stores. • A decline in the birthrate reduces the demand for baby clothes.
2. Tastes and preferences	Direct		• For no apparent reason, consumers want Beanie

			Babies and demand increases. • After a while, the fad dies and demand declines.
3. Income a. Normal goods	Direct		• Consumers' incomes increase, and the demand for steaks increases. • A decline in income decreases the demand for air travel.
b. Inferior goods	Inverse		• Consumers' incomes increase, and the demand for hamburger decreases. • A decline in income increases the demand for

			demand for bus service.
4. Expectations of buyers	Direct		• Consumers expect that gasoline will be in short supply next month and that prices will rise sharply. Consequently, consumers fill the tanks in their cars this month, and there is an increase in demand for gasoline. • Months later, consumers expect the price of gasoline to fall soon, and the demand for gasoline decreases.
5. Prices of related Goods	Direct		• A reduction in the price of tea

Related Goods a. Substitute goods			the price of tea decreases the demand for coffee. • An increase in the price of airfares causes higher demand for bus transportation.
b. Complementary goods	Inverse		• A decline in the price of cellular service increases the demand for cell phones. • A higher price for peanut butter decreases the demand for jelly.

Take Note

Changes in **nonprice determinants shift** the demand curve. Increases in demand shift the demand curve to the right while decreases in demand

demand shift the demand curve to the right while decreases in demand shift the demand curve to the left.

Take Note

Changes in **nonprice determinants shift** the demand curve. Increases in demand shift the demand curve to the right while decreases in demand shift the demand curve to the left.

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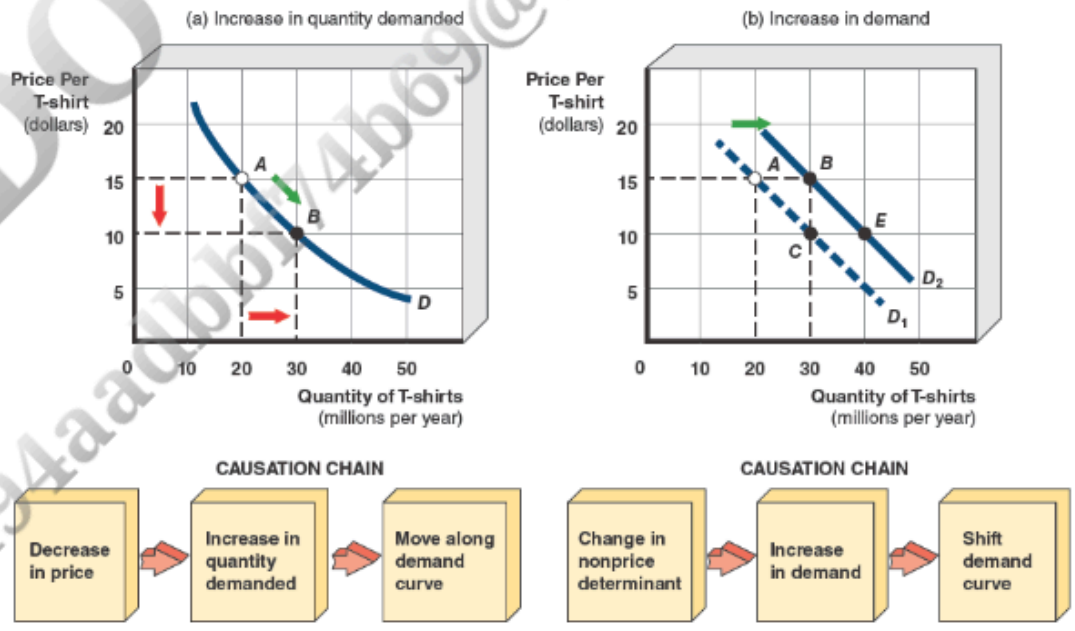
Take Note

Changes in **nonprice determinants shift** the demand curve. Increases in demand shift the demand curve to the right while decreases in demand shift the demand curve to the left.

3-1d. Caution! Movement Along versus Shift of the Demand Curve

It is very important to clearly understand the distinction between a movement along the demand curve and a shift of the demand curve. Changing the price of a good causes a change in the quantity demanded, shown as a movement along the demand curve. Changing any of the nonprice determinants, on the other hand, changes demand, shown as a shift of the entire demand curve. Comparing parts (a) and (b) of Exhibit 4 is helpful in making this distinction.

Exhibit 4 Movement Along versus a Shift in the Demand Curve



▸ Details

Part (a) shows a movement along the demand curve, *D*, for T-shirts. Changing the price of T-shirts changes the quantity demanded and moves us along the demand curve. If the price is initially $15 at point *A*, the quantity demanded by consumers is 20 million T-shirts. If the price then decreases to $10 at point *B*, the quantity demanded increases from 20 million to 30 million T-shirts. So, a change in the price of T-shirts moves us along the demand curve from point *A* to point *B*.
Part (b) illustrates a shift in the demand curve for T-shirts. Changing a nonprice determinant changes demand and shifts the demand curve. If incomes increase and T-shirts are a normal good, demand will increase and the demand curve will shift from D_1 to D_2. This represents an increase in the quantity demanded at every price. At a price of $15, the quantity demanded per year increases by 10 million from 20 million at point *A* to 30 million at point *B*. Similarly, at a price of $10, the quantity demanded per year also increases by 10 million from 30 million at Point *C* to 40 million at point *E*.

Part (a) shows the demand curve, D, for T-shirts per year. We see at point *A* that if the price of T-shirts is $15, the quantity demanded by consumers is 20 million T-shirts. If the price of T-shirts decreases to $10, the quantity demanded increases to 30 million and we move to point *B*. So, a *change in the price* of the good results in a change in the quantity demanded of that good and is reflected as a *movement along* the demand curve for that good.

In part (b), suppose the market demand curve for T-shirts is initially at D_1. If a nonprice determinant (shifter) changes, perhaps incomes increase and T-shirts are a normal good, then demand will increase and there is a shift to the right from D_1 to D_2. This means that at all possible prices, consumers wish to purchase a larger quantity than before the shift occurred. At $15 per T-shirt, for example, 30 million T-shirts (point *B*) will be purchased each year, rather than 20 million T-shirts (point *A*). At $10 per T-shirt, 40 million will be purchased (point *E*) rather than 30 million (point *C*). So, a *change in a nonprice determinant* results in a change in demand and is reflected as a *shift* of the entire demand curve.

Take Note

A change in the price of a product results in a "change in quantity demanded" of that product and is represented as *movement along* the demand curve. A change in a nonprice determinant results in a "change in demand" and is represented by a *shift* of the demand curve.

Am I on Track?

1 Which of the following would cause the demand curve for ice cream to **shift** to the right?

SHOW ANSWER

SHOW ANSWER

SHOW ANSWER

SHOW ANSWER

SHOW ANSWER

A decrease in the price of ice cream

An increase in the price of popsicles

A new study indicating that ice cream consumption is linked to poor concentration

All of the above

3-2. Supply

We just saw how consumer buying decisions are represented with a demand curve. We now describe how the selling decisions of firms are represented with a supply curve.

3-2a. The Supply Curve

In everyday conversations, the term *supply* refers to a specific quantity. A "limited supply" of golf clubs at a sporting goods store means there are only so many clubs for sale and that's all. This interpretation of supply is *not* the economist's definition. To economists, supply is the relationship between various prices and quantities supplied.

Let's think for a minute about what we have already learned. Suppose Farmer Gustavo is trying to decide whether to devote more of his land, labor, and equipment to the production of soybeans. Recall from Chapter 2 the production possibilities curve and the concept of increasing opportunity cost developed in Exhibit 3. If Farmer Gustavo devotes few of his resources to producing soybeans, the opportunity cost of, say, producing wheat is small. But increasing soybean
57 production means a higher opportunity cost, measured by the quantity of wheat not produced. The logical question is: What would induce Farmer Gustavo to produce more soybeans for sale and overcome the higher opportunity cost of producing less wheat? You guessed it! There must be the *incentive* of a higher price for soybeans.

The **law of supply** states there is a direct relationship between the price of a good and the quantity sellers are willing to offer for sale in a defined time period, ceteris paribus. Interpreting the individual *supply curve* for ZapMart shown in Exhibit 5 is basically the same as interpreting Bob's demand curve shown in Exhibit 1. Each point on the **supply curve** represents a quantity supplied (measured along the horizontal axis) at a particular price (measured

along the vertical axis). For example, at a price of $10 per T-shirt (point *C*), the quantity supplied by the seller, ZapMart, is 35,000 T-shirts per year. At the higher price of $15, the quantity supplied increases to 45,000 T-shirts per year (point *B*).

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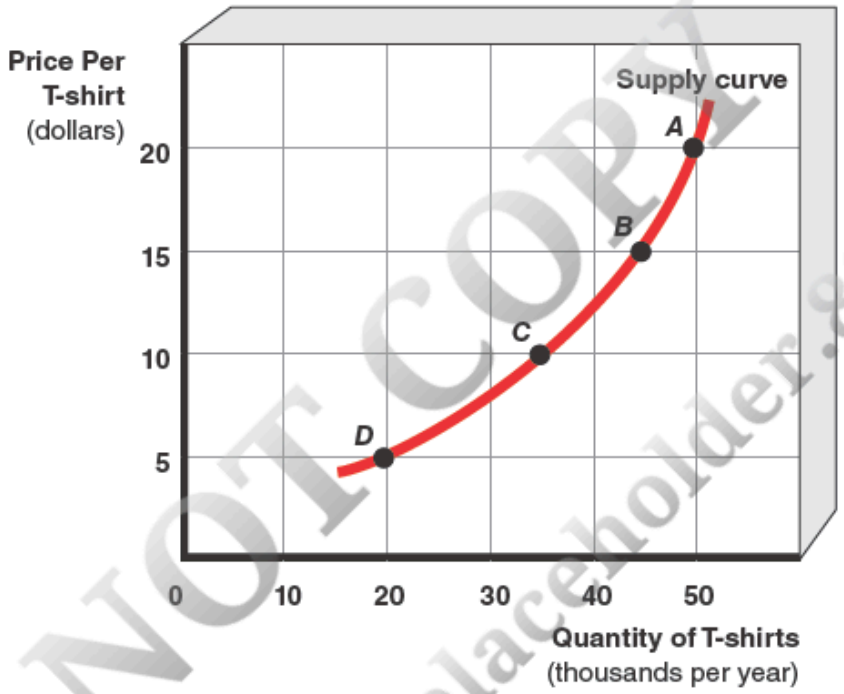
Exhibit 5 An Individual Seller's Supply Curve for T-shirts



▸ Details

The supply curve for an individual seller, such as ZapMart, shows the quantity of T-shirts offered for sale at different possible prices. As the price of T-shirts rises, a retail store has an incentive to increase the quantity of T-shirts supplied per year. The direct relationship between price and quantity supplied conforms to the law of supply.

An Individual Seller's Supply Schedule for T-shirts

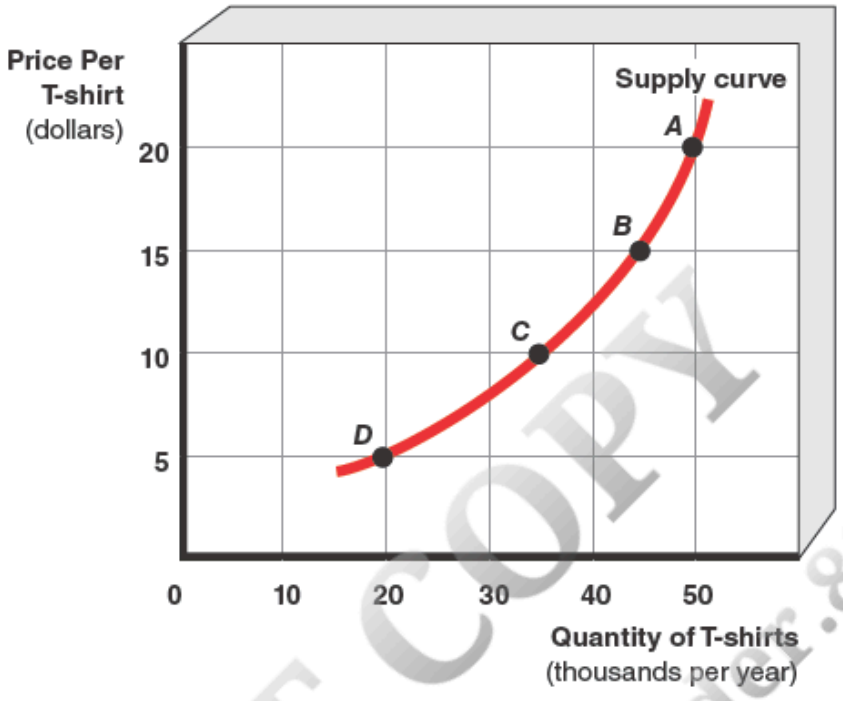
Point	Price per T-shirt	Quantity Supplied (thousands per year)

A	$20	50
B	15	45
C	10	35
D	5	20

Take Note

A **supply curve** shows the different quantities of a product sellers are willing to produce and offer for sale at various prices. The positive slope of a supply curve reflects the **law of supply** where an increase in the price of a product, measured on the vertical axis, causes an increase in the quantity supplied of that product, measured on the horizontal axis.

Exhibit 5 An Individual Seller's Supply Curve for T-shirts



▸ Details

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An Individual Seller's Supply Schedule for T-shirts

Point	Price per T-shirt	Quantity Supplied (thousands per year)
A	$20	50
B	15	45

C	10	35
D	5	20

Take Note

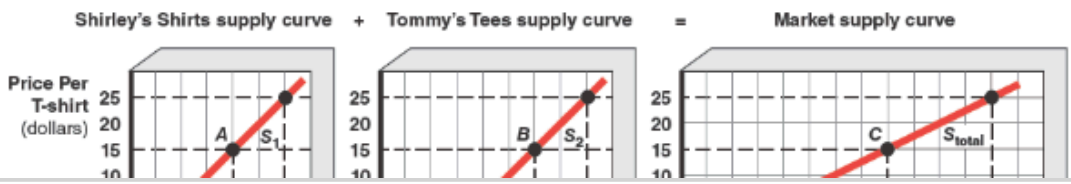
A **supply curve** shows the different quantities of a product sellers are willing to produce and offer for sale at various prices. The positive slope of a supply curve reflects the **law of supply** where an increase in the price of a product, measured on the vertical axis, causes an increase in the quantity supplied of that product, measured on the horizontal axis.

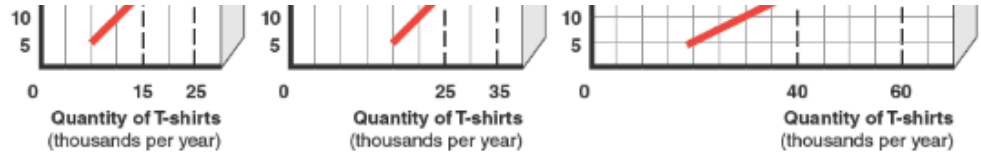
3-2b. Market Supply

To construct a market supply curve, we follow the same procedure used to derive a market demand curve. That is, we *horizontally* sum all the quantities supplied by individual firms at various prices that might prevail in the market.

Let's assume in Exhibit 6 that Shirley's Shirts and Tommy's Tees are the only two firms selling T-shirts in a given market. At a price of $15, Shirley's Shirts will supply 15,000 T-shirts per year (point *A*), and Tommy's Tees will supply 25,000 T-shirts per year (point *B*) for a total quantity supplied of 40,000 T-shirts (point *C*). Repeating the same process for other prices generates the market supply curve, S_{total} . For example, at a price of $25 the total quantity supplied is 60,000 T-shirts.

Exhibit 6 The Market Supply Curve for T-shirts





▸ Details

Shirley's Shirts and Tommy's Tees are two businesses selling T-shirts. If these are the only two firms in the T-shirt market, the market supply curve, S_{total}, can be derived by summing horizontally the individual supply curves, S_1 and S_2.

The Market Supply Schedule for T-shirts

	Quantity Supplied (thousands per year)				
Price per T-shirt	**Shirley's Shirts**	+	**Tommy's Tees**	=	**Total Supply**
$25	25		35		60
20	20		30		50
15	15		25		40
10	10		20		30
5	5		15		20

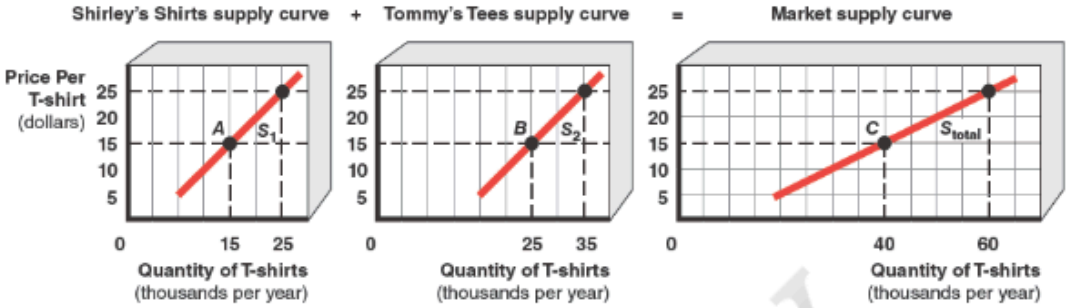
As with demand, it's important to be clear about the terminology that economists use. If we change the price of T-shirts from $15 to $25, there will be a

change in the quantity supplied in the market from 40,000 to 60,000 T-shirts. A **change in quantity supplied** is a movement from one point to another point along a stationary supply curve, ceteris paribus, that results from a change in the price of the product, in this case, T-shirts.

Take Note

A market supply curve is derived by horizontally summing the individual supply curves of all producers in the market.

Exhibit 6 The Market Supply Curve for T-shirts



▸ Details

Shirley's Shirts and Tommy's Tees are two businesses selling T-shirts. If these are the only two firms in the T-shirt market, the market supply curve, S_{total}, can be derived by summing horizontally the individual supply curves, S_1 and S_2.

The Market Supply Schedule for T-shirts

	Quantity Supplied (thousands per year)				
Price per T-shirt	**Shirley's Shirts**	+	**Tommy's Tees**	=	**Total Supply**
$25	25		35		60
20	20		30		50
15	15		25		40
10	10		20		30

5	5		15		20

As with demand, it's important to be clear about the terminology that economists use. If we change the price of T-shirts from $15 to $25, there will be a change in the quantity supplied in the market from 40,000 to 60,000 T-shirts. A **change in quantity supplied** is a movement from one point to another point along a stationary supply curve, ceteris paribus, that results from a change in the price of the product, in this case, T-shirts.

Take Note

A market supply curve is derived by horizontally summing the individual supply curves of all producers in the market.

3-2c. Shifts of the Supply Curve

As with demand, the price of a product is not the only factor that influences how much sellers offer for sale. If we relax the ceteris paribus assumption and allow other variables previously held constant to change, then a variety of factors can influence the position of the supply curve and cause it to shift.

A **change in supply** is an increase or a decrease in the quantity supplied at each possible price. An increase in supply is a rightward shift in the entire supply curve. A decrease in supply is a leftward shift in the entire supply curve. is an increase (rightward shift) or a decrease (leftward shift) in the quantity supplied at each possible price. If ceteris paribus no longer applies, we consider five major nonprice determinants that can shift the supply curve:

1. The number of sellers
2. Technology
3. Resource prices

3. Resource prices

4. Expectations of sellers

5. Prices of other goods the firm can produce

Number of Sellers

What happens when a severe drought destroys wheat or a frost ruins the orange crop? The damaging effect of the weather may force orange growers out of business, and supply decreases, shifting the supply curve to the left. Internationally, the United States may decide to lower trade barriers on textile imports, and this action increases supply by allowing new foreign firms to add their individual supply curves to the U.S. market supply curve for textiles. Conversely, higher U.S. trade barriers on textile imports shift the U.S. market supply curve for textiles leftward.

Technology

Never has society experienced such an explosion of new production techniques. Throughout the world, new and more efficient technology is making it possible to manufacture more products at any possible selling price. New, more powerful personal computers (PCs) reduce production costs and increase the supply of all sorts of goods and services. For example, computers are now milking cows. Computers admit the cows into the milking area and then activate lasers to guide milking cups into place. Dairy farmers no longer must wake up at 5:30 a.m., and cows get milked whenever they wish, day or night. As this technology spreads across the United States, it will be possible to offer more milk for sale at each possible price, and the entire supply curve for milk will shift to the right.

Resource Prices

Natural resources, labor, capital, and entrepreneurship are all required to produce products, and the prices of these resources affect supply. Suppose many firms are competing for computer programmers to design their software, and the salaries of these highly skilled workers increase. This increase in the price of labor adds to the cost of production. Along the original supply curve, extra costs must be added to each possible price. As a result, the supply of computer software shifts leftward (decreases) because sellers must charge more than before for any quantity supplied. Any reduction in production cost caused by a decline in the price of resources will have an opposite effect on the supply curve and it shifts rightward (increases). Along the original supply curve, cost declines, so the price can be reduced at each possible quantity supplied.

Expectations of Sellers

As we saw with demand, expectations can affect current supply. Consider again what happens if a war breaks out in the Middle East that causes oil producers to believe that oil prices will rise dramatically.

Their initial response might be to hold back a portion of the oil in their storage tanks so that they can sell more and make greater profits later when oil prices rise. One approach used by the major oil companies might be to limit the amount of gasoline delivered to independent distributors. This response by the oil industry decreases supply, shifting the current supply curve to the left. As a different example, suppose farmers anticipate that the price of wheat will soon fall sharply. The reaction is to sell their inventories stored in silos today before the price declines tomorrow. Such a response shifts the supply curve for wheat to the right.

Prices of Other Goods the Firm Could Produce

Businesses are always considering shifting resources from producing one good to producing another good. A rise in the price of one product relative to the prices of other products signals to suppliers that switching production to the

prices of other products signals to suppliers that switching production to the product with the higher relative price yields higher profit. Suppose the price of wheat remains the same while the price of corn rises because government incentives to increase ethanol production increase the demand for corn, which is used to produce ethanol. Farmers will divert more of their land to corn where they can earn more profit and less to wheat. The result is an increase in the supply of corn (shift to the right) and a decrease in the supply of wheat (shift to the left). This happens because the opportunity cost of growing wheat, measured in forgone corn profits, increases.

Exhibit 7 summarizes the relationship between changes in the nonprice determinants of supply and the supply curve, accompanied by examples for each.

Exhibit 7 Nonprice Determinants of Supply

Nonprice Determinant of Supply	Relationship to Changes in Supply Curve	Shift in the Supply Curve	Examples
1. Number of sellers	Direct		• The United States lowers trade restrictions on foreign textiles, and the supply of textiles in the United States increases.

			• A severe drought destroys the orange crop, and the supply of oranges decreases.
2. Technology	Direct		• New methods of producing automobiles reduce production costs, and the supply of automobiles increases. • Technology is destroyed in war, and production costs increase; the result is a decrease in the supply of good *X*.

3. Resource prices	Inverse		• A decline in the price of computer chips increases the supply of computers. • An increase in the cost of farm equipment decreases the supply of soybeans.
4. Expectations	Inverse		• Oil companies anticipate a substantial rise in future oil prices, and this expectation causes these companies to decrease their

			current supply of oil. • Farmers expect the future price of wheat to decline, so they increase the present supply of wheat.
5. Prices of other goods and services	Inverse		• A rise in the price of brand-name drugs causes drug companies to decrease the supply of generic drugs. • A decline in the price of tomatoes causes farmers to increase the supply of

			cucumbers.

Take Note

Changes in **nonprice determinants shift** the supply curve. Increases in supply will shift the supply curve to the right while decreases in supply will shift the supply curve to the left.

3-2d. Caution! Movement Along versus Shift of the Supply Curve

As with demand, it is very important to clearly understand the distinction between a movement along the supply curve and a shift of the supply curve. Changing the price of a good causes a change in the quantity supplied, shown as a movement along the supply curve. Changes in any of the nonprice determinants changes supply, shown as a shift of the entire supply curve. Comparing parts (a) and (b) of Exhibit 8 helps to make this distinction.

Notice that a *change in a nonprice determinant* results in a change in supply and is reflected as a *shift* of the entire supply curve.

Take Note

A change in the price of a product results in a "change in the quantity supplied" of that product and is represented as *movement along* the supply curve. A change in a nonprice determinant results in a "change in supply" and is represented by a *shift* in the supply curve.

Am I on Track?

2 Which of the following would cause the demand curve for ice cream to **shift** to the right?

SHOW ANSWER

SHOW ANSWER

An increase in the price of ice cream

A new technology that makes it cheaper and easier to produce ice cream

All of the above

All of the above

Notice that a *change in a nonprice determinant* results in a change in supply and is reflected as a *shift* of the entire supply curve.

Take Note

A change in the price of a product results in a "change in the quantity supplied" of that product and is represented as *movement along* the supply curve. A change in a nonprice determinant results in a "change in supply" and is represented by a *shift* in the supply curve.

Am I on Track?

2 Which of the following would cause the demand curve for ice cream to **shift** to the right?

SHOW ANSWER

SHOW ANSWER

SHOW ANSWER

SHOW ANSWER

An increase in the price of ice cream

A new technology that makes it cheaper and easier to produce ice cream

All of the above

All of the above

3-3. Market Equilibrium

"Teach a parrot to say 'supply and demand' and you've got an economist."
Understanding the interaction of supply and demand in a market is one of the most important economic skills to master. A **market** is any arrangement in which buyers and sellers interact to determine the price and quantity of goods and services exchanged.

3-3a. Surplus versus Shortage

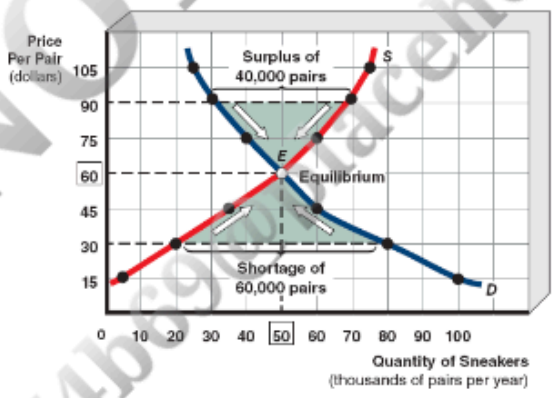
Let's begin our study of a market by considering the retail market for sneakers. Panel (a) of Exhibit 9 displays hypothetical market demand and supply data for
64 **Market** sneakers. Notice in column 1 that price serves as a common variable for both supply and demand relationships. Columns 2 and 3 list the quantity demanded and the quantity supplied for pairs of sneakers per year. These numbers, when plotted on a graph, form the demand and supply curves seen in panel (b).

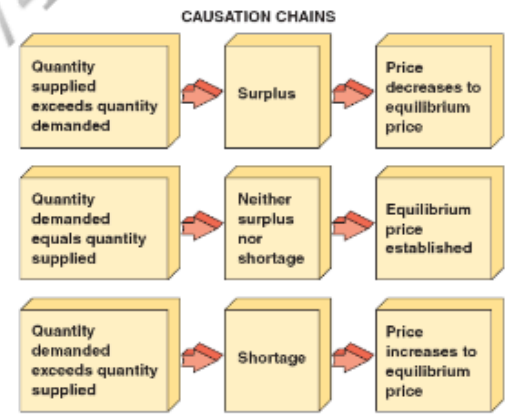
Exhibit 9a Demand, Supply, and Equilibrium for Sneakers (Pairs per Year)

(1) Price per Pair	(2) Quantity Demanded	(3) Quantity Supplied	(4) Difference (3)–(2)	(5) Market Condition	(Pres on I
$105	25,000	75,000	+50,000	Surplus	Dowı
90	30,000	70,000	+40,000	Surplus	Dowı

75	40,000	60,000	+20,000	Surplus	Down
60	50,000	50,000	0	Equilibrium	Stati
45	60,000	35,000	-25,000	Shortage	Upv
30	80,000	20,000	-60,000	Shortage	Upv
15	100,000	5,000	-95,000	Shortage	Upv

Exhibit 9b The Demand and Supply for Sneakers





▸ Details

The demand and supply curves represent a market for sneakers. The intersection of the demand curve, *D*, and the supply curve, *S*, at point *E* indicates the equilibrium price of $60 and the equilibrium quantity of 50,000 pairs bought and sold per year. At any price above $60, a surplus prevails and pressure exists to push the price downward. At $90, for example, the excess quantity supplied of 40,000 pairs remains unsold. Lowering the price will result in movements along the supply and demand curves, moving the market toward equilibrium. At any price below $60, a shortage provides pressure to push the price upward. At $30, for example, the excess quantity demanded of 60,000 pairs encourages consumers to bid up the price. Raising the price will result in movements along the supply and demand curves, once again moving the market to equilibrium.

The important question for market supply and demand analysis is this: Which selling price and quantity will prevail in the market? Let's start by asking what will happen if retail stores supply 75,000 pairs of sneakers and charge $105 a pair. At this relatively high price for sneakers, consumers are willing and able to purchase only 25,000 pairs. As a result, 50,000 pairs of sneakers remain as unsold inventory on the shelves of sellers (column 4), and the market condition is a surplus (column 5). A **surplus** is a market condition existing at any price where the quantity supplied is greater than the quantity demanded.

How will retailers react to a surplus? Competition forces sellers to bid down their selling price to attract more sales (column 6). If they cut the selling price to $90, there will still be a surplus of 40,000 pairs of sneakers, and pressure on sellers to cut their selling price will continue. If the price falls to $75, there will still be an unwanted surplus of 20,000 pairs of sneakers remaining as inventory, and pressure to charge a lower price will persist.

Now let's assume sellers slash the price of sneakers to $15 per pair. This price is very attractive to consumers, and the quantity demanded is 100,000 pairs of sneakers each year. However, sellers are willing and able to provide only 5,000 pairs at this price. Some consumers buy these 5,000 pairs of sneakers at $15, but there remain potential buyers willing to purchase 95,000 more pairs at that price, but cannot because the shoes are not on the shelves for sale. This out-of-stock condition signals the existence of a shortage. A **shortage** is a market condition existing at any price where the quantity supplied is less than the quantity demanded.

In the case of a shortage, unsatisfied consumers compete to obtain the product by bidding to pay a higher price. Because sellers are seeking the higher profits that higher prices make possible, they gladly respond by setting a higher price of, say, $30 and increasing the quantity supplied to 20,000 pairs annually. At the price of $30, the shortage persists because the quantity demanded still exceeds the quantity supplied. Thus, a price of $30 will also be temporary because the unfulfilled quantity demanded provides an incentive for sellers to raise their selling price further and offer more sneakers for sale. Suppose the price of

selling price further and offer more sneakers for sale. Suppose the price of sneakers rises to $45 a pair. At this price, the shortage falls to 25,000 pairs, and the market still gives sellers the message to move upward along their market supply curve and sell for a higher price.

3-3b. Equilibrium Price and Quantity

Assuming sellers are free to sell their products at any price, trial and error will make all possible price-quantity combinations unstable except at equilibrium. **Equilibrium** occurs at any price and quantity where the quantity demanded and the quantity supplied are equal. Economists also refer to equilibrium as market clearing.

In Exhibit 9, $60 is the *equilibrium* price, and 50,000 pairs of sneakers is the *equilibrium* quantity per year. Equilibrium means that the forces of supply and demand are "in balance" or "at rest" and there is no reason for price or quantity to change, ceteris paribus. In short, all prices and quantities except a unique equilibrium price and quantity are temporary. Once the price of sneakers is $60, this price will not change unless a nonprice factor changes demand or supply.

English economist Alfred Marshall (1842–1924) compared supply and demand to a pair of scissor blades. He wrote, "We might as reasonably dispute whether it is the upper or the under blade of a pair of scissors that cuts a piece of paper, as whether value is governed by utility [demand] or cost of production [supply]."

Joining market supply and market demand in Exhibit 9, panel (b) allows us to clearly see the "two blades," that is, the demand curve, *D*, and the supply curve, *S*. We can measure the amount of any surplus or shortage by the horizontal distance between the demand and supply curves. At any price *above* the equilibrium—say, $90—there is an *excess quantity supplied* (surplus) of 40,000 pairs of sneakers (the 70,000 quantity supplied minus the 30,000 quantity demanded). For any price *below* equilibrium—$30, for example—the horizontal distance between the curves tells us there is an *excess quantity demanded* (shortage) of 60,000 pairs (the 80,000 quantity demanded minus the 20,000 quantity supplied). When the price per pair is $60, the market supply curve and

the market demand curve intersect at point *E* and the quantity demanded equals the quantity supplied at 50,000 pairs per year. At this price, there is neither a shortage nor a surplus of sneakers, and therefore no tendency for the price to change.

Take Note

Graphically, the intersection of the supply curve and the demand curve is the market equilibrium price-quantity point. This is the price where there is neither a shortage nor a surplus and quantity demanded exactly equals quantity supplied.

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Take Note

Graphically, the intersection of the supply curve and the demand curve is the market equilibrium price-quantity point. This is the price where there is neither a shortage nor a surplus and quantity demanded exactly equals quantity supplied.

3-3c. Rationing Function of the Price System

Our analysis leads to an important conclusion. The **price system** is a mechanism that uses the forces of supply and demand to create equilibrium through rising and falling prices. And the price system plays a *rationing* role because the prices established in markets distribute scarce and limited goods and services to only

those who are willing *and* able to pay the prevailing market price. At the equilibrium price of $60, only those consumers willing and able to pay $60 per pair get sneakers, and there are no shoes for buyers unwilling or unable to pay that price.

Am I on Track?

3 If the price in a market is currently below equilibrium then a _____ will cause _____ pressure on prices, eventually leading to equilibrium in the market.

SHOW ANSWER

SHOW ANSWER

shortage; downward

shortage; upward

surplus; downward

surplus; upward

Am I on Track?

3 If the price in a market is currently below equilibrium then a _____ will cause _____ pressure on prices, eventually leading to equilibrium in the market.

SHOW ANSWER

SHOW ANSWER

SHOW ANSWER

SHOW ANSWER

shortage; downward

shortage; upward

surplus; downward

surplus; upward

3-4. Changes in Market Equilibrium

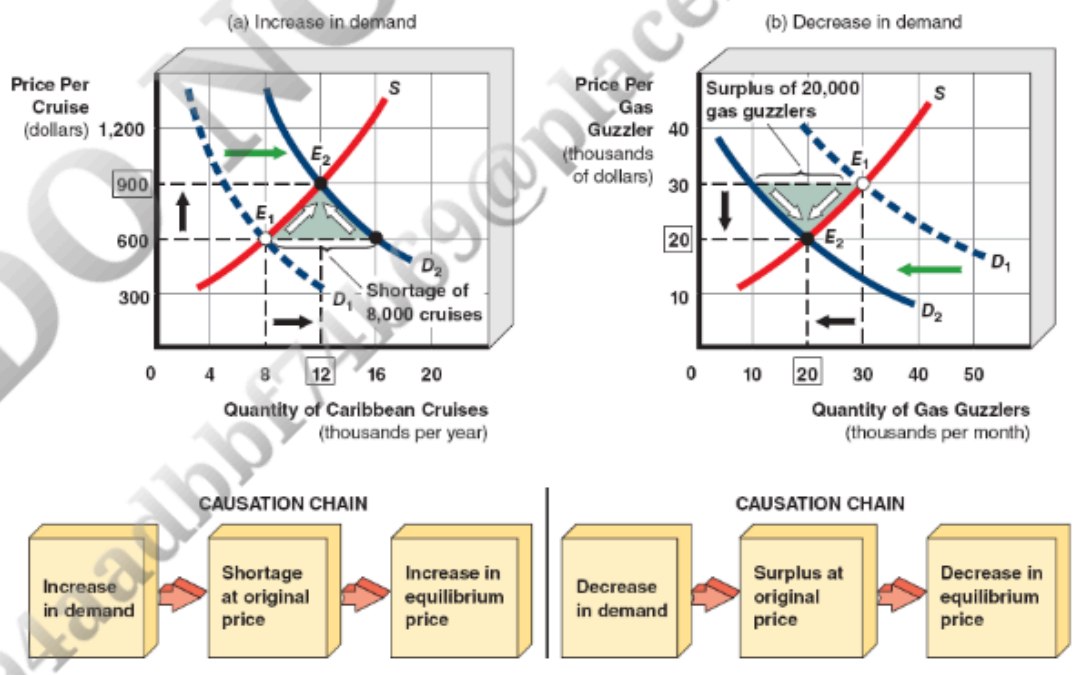
When you understand how buyers and sellers respond to changes in equilibrium prices, you begin to understand the economic way of thinking. Now that we have established how any market achieves equilibrium, let's examine how changes in demand and supply can create a new market equilibrium price and quantity.

and quantity.

3-4a. Changes in Demand

The Caribbean cruise market shown in Exhibit 10(a) assumes market supply, *S*, is constant and market demand increases from D_1 to D_2. Why has the demand curve shifted rightward in the figure? We will assume the popularity of cruises to these vacation islands has suddenly risen sharply due to extensive advertising that influenced tastes and preferences. Given supply curve *S* and demand curve D_1, the initial equilibrium price is $600 per cruise, and the initial equilibrium quantity is 8,000 cruises per year, shown as point E_1. After the impact of advertising, the new equilibrium point, E_2, becomes 12,000 cruises per year at a price of $900 each. Thus, the increase in demand causes both the equilibrium price and the equilibrium quantity to increase.

Exhibit 10 The Effects of Shifts in Demand on Market Equilibrium



▸ Details

In part (a), demand for Caribbean cruises increases because of extensive advertising and the demand curve shifts rightward from D_1 to D_2. This shift in demand causes a temporary shortage of 8,000 cruises per year at the

shift in demand causes a temporary shortage of 8,000 cruises per year at the initial equilibrium price of $600. This disequilibrium condition encourages firms in the cruise business to raise their price, resulting in movement upward along the supply curve by firms, and upward movement along the new demand curve, D_2, by consumers, to a new equilibrium at E_2. Notice that an increase in demand increases the equilibrium price and increases the equilibrium quantity.

Part (b) illustrates a decrease in the demand for gas-guzzling automobiles (SUVs) caused by a sharp rise in the price of gasoline (a complement). This leftward shift in demand from D_1 to D_2 results in a temporary surplus of 20,000 gas guzzlers per month at the initial equilibrium price of $30,000. This disequilibrium condition forces sellers of these cars to lower their price resulting in movement downward along the supply curve by sellers and movement downward along the new demand curve, D_2, by buyers, to a new equilibrium at $\mathbf{E_2}$. Notice that a decrease in demand decreases the equilibrium price, and decreases the equilibrium quantity.

It is important to understand the force that caused the equilibrium to shift from $_1$ to $_2$. When demand initially increased from $_1$ to $_2$, there was a temporary shortage of 8,000 cruises (16,000–8,000) at $600 per cruise. Firms in the cruise business responded to the excess demand by hiring more workers, offering more cruises to the Caribbean, and raising the price. The cruise lines therefore move upward along the supply curve (increasing *quantity supplied*, but not changing *supply*). Similarly, consumers respond to these price increases by moving upward along the demand curve (decreasing *quantity demanded*, but not changing *demand*). During some period of trial and error, Caribbean cruise sellers increase their price until a shortage no longer exists at point $_2$. Therefore, the increase in demand causes both the equilibrium price and the equilibrium quantity to increase. Note the importance of what we've already learned about the laws of demand and supply. In this example, as producers increased the price in response to a shortage, that price change resulted in a movement along each of the curves that brought us to the new equilibrium.

What will happen to the demand for gas-guzzling automobiles (for example, SUVs) if the price of gasoline triples? Because gasoline and automobiles are complements, a rise in the price of gasoline decreases the demand for gas guzzlers from $_1$ to $_2$ in Exhibit 10(b). At the initial equilibrium price of $30,000 per gas guzzler, the quantity supplied now exceeds the quantity demanded by 20,000 automobiles per month $(30{,}000 - 10{,}000)$. This unwanted inventory forces automakers to reduce the price. This results in a movement downward along the supply curve by firms and downward along the demand curve by consumers. Market equilibrium changes from $_1$ to $_2$ as the equilibrium price falls from $30,000 to $20,000, and the equilibrium quantity falls from 30,000 to 20,000 gas guzzlers per month.

Am I on Track?

4 An increase in demand initially creates a _____ at the original price, and the price will _____ over time.

original price, and the price will _____ over time.

SHOW ANSWER

SHOW ANSWER

SHOW ANSWER

surplus; fall

surplus; rise

shortage; fall

shortage; rise

3-4b. Changes in Supply

Now reverse the analysis by assuming demand remains constant and allow some nonprice determinant to shift the supply curve. In Exhibit 11(a), begin at point E_1 in a market for babysitting services at an equilibrium price of $9 per hour and 4,000 babysitters hired per month. Then assume there is a demographic shift and the number of people available to babysit rises. This increase in the number of sellers shifts the market supply curve rightward from S_1 to S_2 and creates a temporary surplus of 4,000 babysitters ($8{,}000 - 4{,}000$) at the initial equilibrium price of $9 who offer their services but are not hired. The unemployed babysitters respond by reducing the price, which is a movement downward along S_2 as fewer babysitters are available for hire

increasing their price from $400 to $600 per thousand board feet, and a new equilibrium is established at E_2, where the equilibrium quantity is 6 billion board feet per year.

Exhibit 12 gives a concise summary of the impact of changes in demand or supply on market equilibrium.

Exhibit 12 Summary of Curve Shifts on Equilibrium Price and Quantity

Change	Effect on Equilibrium Price	Effect on Equilibrium Quantity
Demand increases	Increases	Increases
Demand decreases	Decreases	Decreases
Supply increases	Decreases	Increases
Supply decreases	Increases	Decreases

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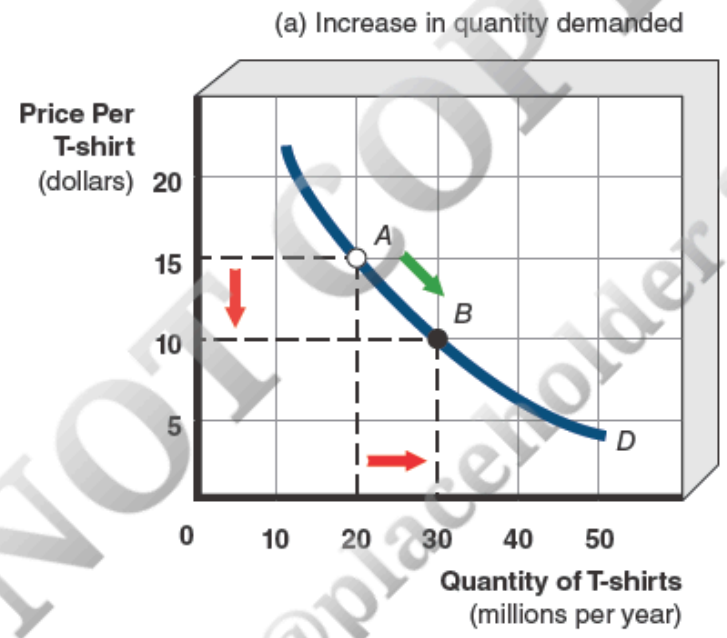
72

Summary

- The law of demand states there is an inverse relationship between the price and the quantity demanded, ceteris paribus. A market demand curve is the horizontal summation of individual demand curves.
- A change in quantity demanded is a movement along a stationary demand curve caused by a change in price.



▸ Details

- A change in demand occurs when any of the nonprice determinants of demand change, which causes the demand curve to shift. An *increase in demand* (rightward shift) or a *decrease in demand* (leftward shift) is caused by a change in one of the nonprice determinants.

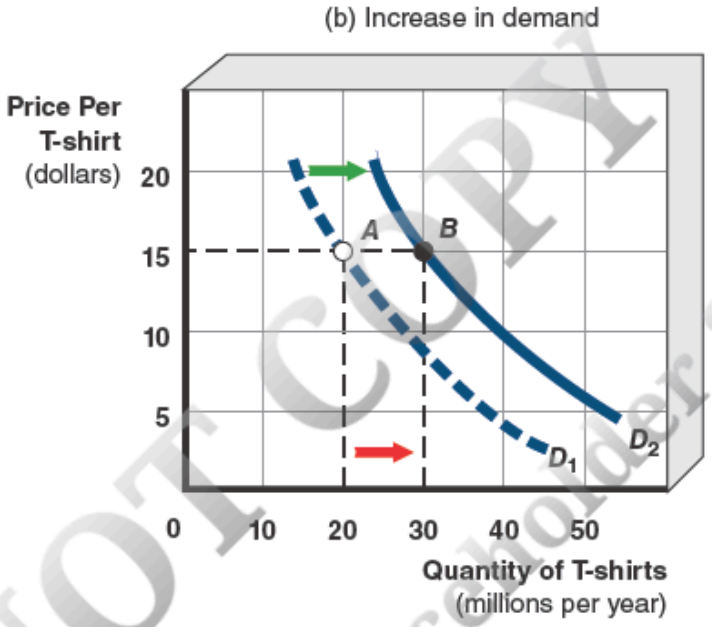
73

- Nonprice determinants of demand are as follows:
  - **a.** Number of buyers
  - **b.** Tastes and preferences
  - **c.** Income (normal and inferior goods)

d. Expectations of future price and income changes

e. Prices of related goods (substitutes and complements)

- The law of supply states there is a direct relationship between the price and the quantity supplied, ceteris paribus. The market supply curve is the horizontal summation of individual supply curves.



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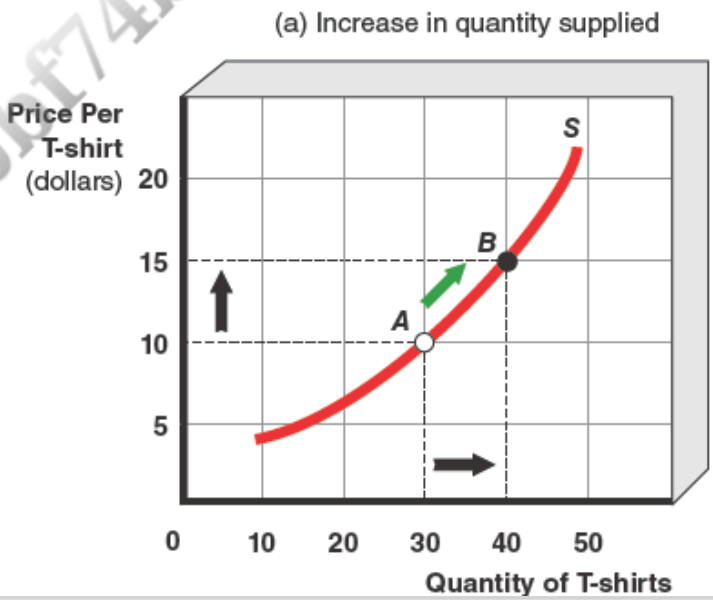
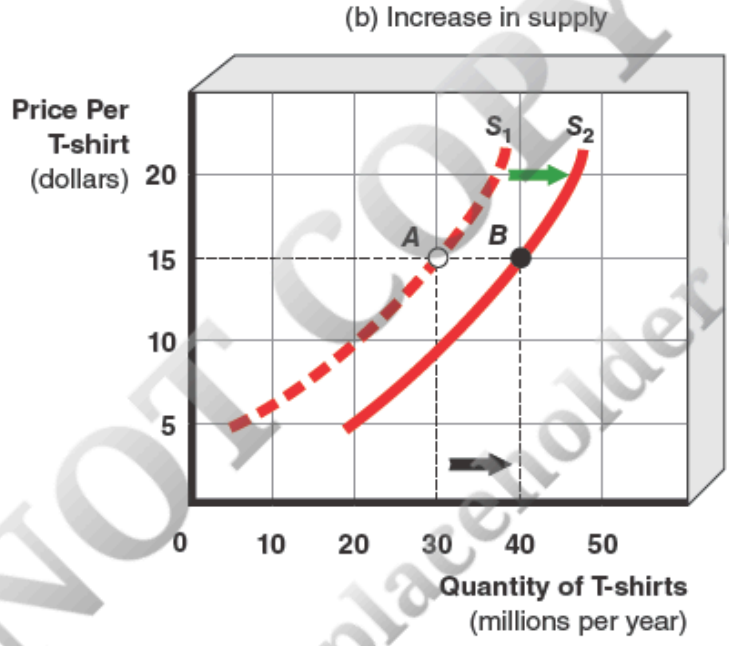


Quantity of T-shirts
(millions per year)

▸ Details

- A change in supply occurs when any of the nonprice determinants of supply change, which shifts the supply curve. An *increase in supply* (rightward shift) or a *decrease in supply* (leftward shift) is caused by a change in one of the nonprice determinants.



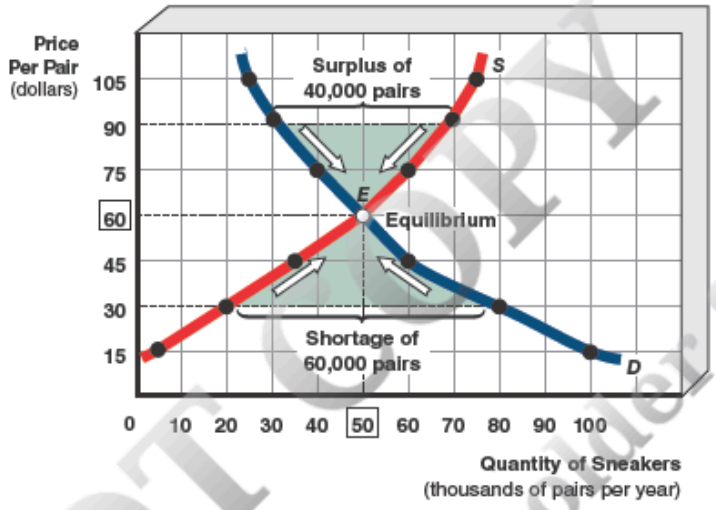
▸ Details

- Nonprice determinants of supply are as follows:
  - **a.** Number of sellers
  - **b.** Technology
  - **c.** Resource prices
  - **d.** Expectations of future price changes
  - **e.** Prices of other goods and services

A surplus or shortage exists at any price where the quantity demanded and the quantity supplied are not equal. When the price of a good is

higher than the equilibrium price, there is an excess quantity supplied, or *surplus*. When the price is less than the equilibrium price, there is an excess quantity demanded, or *shortage*.

- Equilibrium is the unique price and quantity established at the intersection of the supply and demand curves. Only at equilibrium does quantity demanded equal quantity supplied.



▸ Details

- The price system is the supply and demand mechanism that establishes equilibrium through the ability of prices to rise and fall.
- A shift in one of the curves results in a new equilibrium price and quantity as summarized in the table. To determine the impact of two curves shifting simultaneously, combine the appropriate rows in the table.

Change	Effect on Equilibrium Price	Effect on Equilibrium Quantity
Demand increases	Increases	Increases
Demand	Decreases	Decreases

Demand decreases	Decreases	Decreases
Supply increases	Decreases	Increases
Supply decreases	Increases	Decreases

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  a. Number of buyers

  b. Tastes and preferences

  c. Income (normal and inferior goods)

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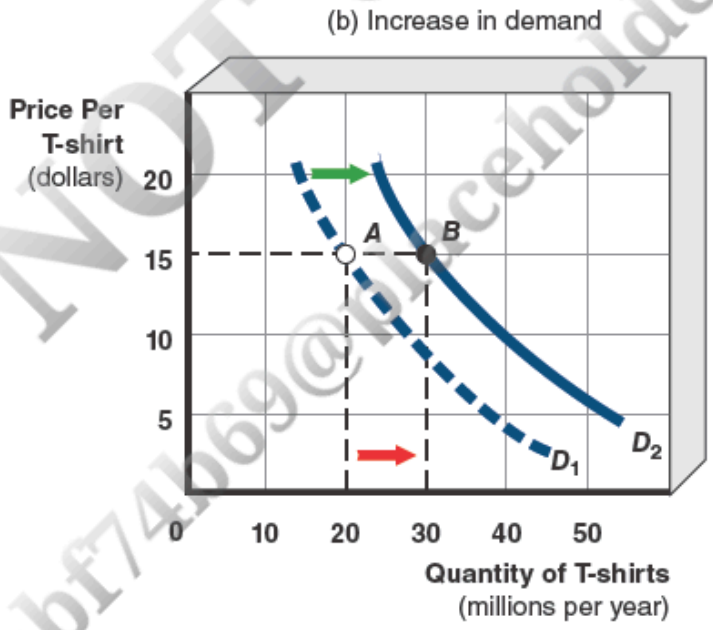

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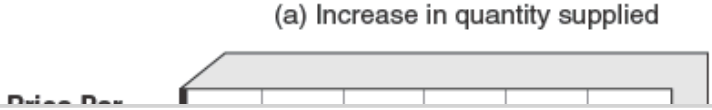

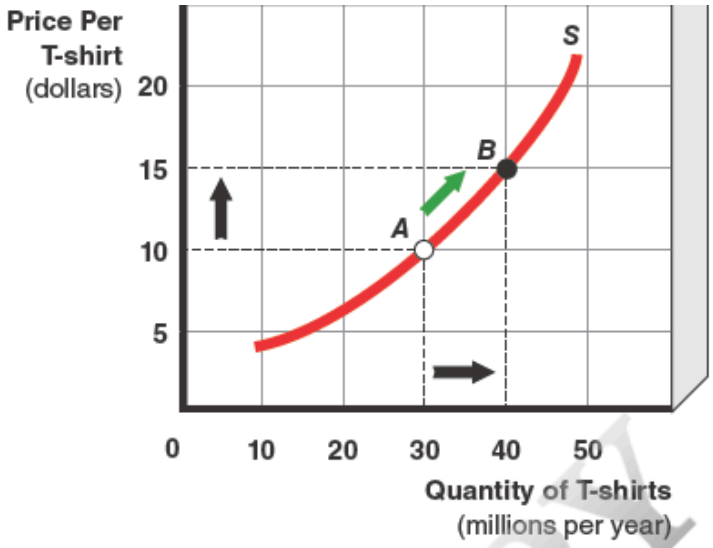

▸ Details

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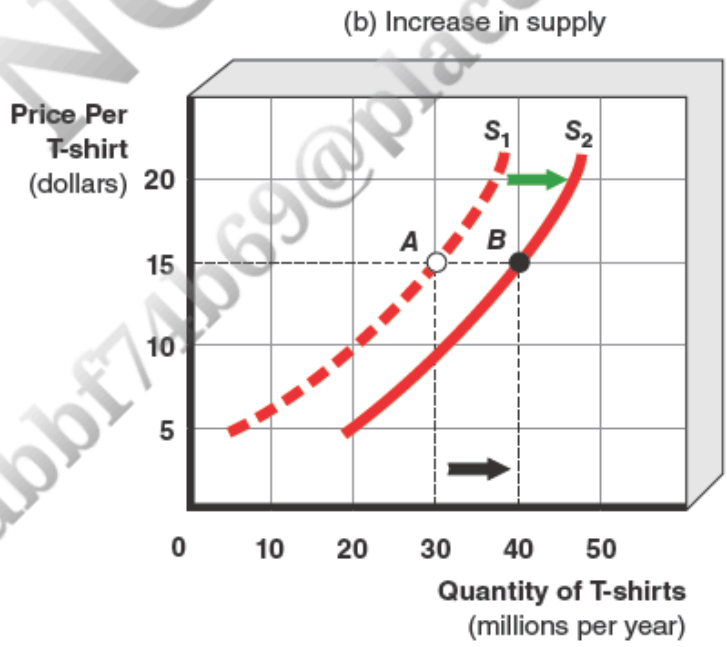

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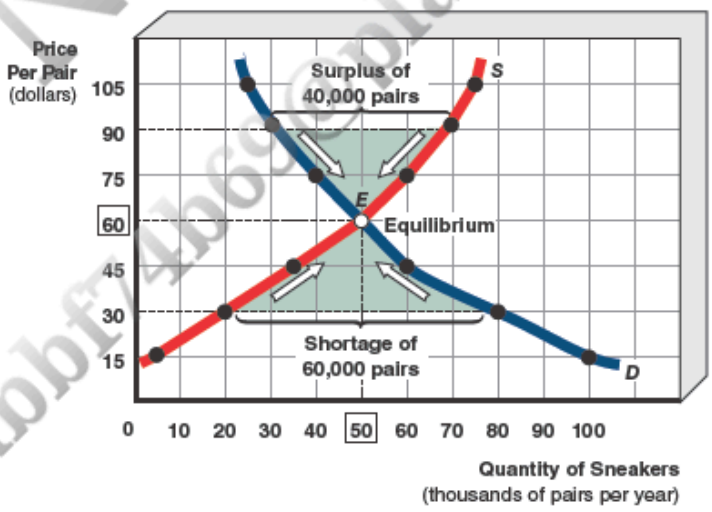

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Supply increases	Decreases	Increases
Supply decreases	Increases	Decreases

Take Note Revisited

- A **demand curve** shows the different quantities of a product consumers are willing to purchase at various prices. The negative slope of a demand curve reflects the **law of demand** where a decrease in the price of a product, measured on the vertical axis, causes an increase in the quantity demanded of that product, measured on the horizontal axis.
- A market demand curve is derived by horizontally summing the individual demand curves of all consumers in the market
- Changes in **nonprice determinants shift** the demand curve. Increases in demand shift the demand curve to the right while decreases in demand

shift the demand curve to the left.

- A change in the price of a product results in a “change in quantity demanded” of that product and is represented as *movement along* the demand curve. A change in a nonprice determinant results in a “change in demand” and is represented by a *shift* of the demand curve.

- A **supply curve** shows the different quantities of a product sellers are willing to produce and offer for sale at various prices. The positive slope of a supply curve reflects the **law of supply** where an increase in the price of a product, measured on the vertical axis, causes an increase in the quantity supplied of that product, measured on the horizontal axis.

- A market supply curve is derived by horizontally summing the individual supply curves of all producers in the market.

- Changes in **nonprice determinants shift** the supply curve. Increases in supply will shift the supply curve to the right while decreases in supply will shift the supply curve to the left.

- A change in the price of a product results in a "change in the quantity supplied" of that product and is represented as *movement along* the supply curve. A change in a nonprice determinant results in a "change in supply" and is represented by a *shift* in the supply curve.

- Graphically, the intersection of the supply curve and the demand curve is the market equilibrium price-quantity point. This is the price where there is neither a shortage nor a surplus and quantity demanded exactly equals quantity supplied.

Study Questions and Problems

Please see Appendix A for answers to the odd-numbered questions. Your instructor has access to the answers for even-numbered questions.

1. Some people will pay a higher price for brand-name goods. For example, some people buy Rolls Royce cars and Rolex watches to impress others. Does

knowingly paying higher prices for certain items just to be a “snob” violate the law of demand?

SHOW ANSWER

2. Draw graphs to illustrate the difference between a decrease in the quantity demanded and a decrease in demand for Mickey Mantle baseball cards. Give a possible reason for change in each graph.

3. Suppose oil prices rise sharply for years as a result of war in the Persian Gulf region. What happens and why to the demand for each of the following?

a. Cars

b. Home insulation

c. Coal

d. Tires

SHOW ANSWER

4. Draw graphs to illustrate the difference between a decrease in quantity supplied and a decrease in supply for condominiums. Give a possible reason for change in each graph.

5. Suppose war in the Middle East threatened oil supplies, and gasoline prices began rising. Consumers feared future oil shortages, so they rushed to fill up their gas tanks. In this case, as the price of gas increased, consumers bought more, not less. Is this an exception to the law of demand?

SHOW ANSWER

6 Predict the direction of change for either supply or demand in the following situations:

following situations.

Several new companies enter the cell phone industry.

Consumers suddenly decide SUVs are unfashionable.

Frost threatens to damage the coffee crop, and consumers expect the price to rise sharply in the future.

The price of tea falls. What is the effect on the coffee market?

The price of sugar rises. What is the effect on the coffee market?

A new type of robot is invented that will pick peaches.

7. There is a shortage of college basketball and football tickets for some games, and a surplus occurs for other games. Why do shortages and surpluses exist for different games? Assume ticket prices are the same for all of a team's home games during a season.

SHOW ANSWER

8. Explain why the market price may not be the same as the equilibrium price.

9. Explain the statement "People respond to incentives and disincentives" in relation to the demand curve and supply curve for good *X*.

SHOW ANSWER

10. What are the advantages and disadvantages of the price system?

11. Suppose a market is in equilibrium and both demand and supply curves increase. What happens to the equilibrium price if demand increases more than supply?

SHOW ANSWER

Sample Quiz

Please see Appendix B for answers to Sample Quiz questions.

1. Which of the following causes the demand for veggie burgers to increase?

SHOW ANSWER

SHOW ANSWER

SHOW ANSWER

A decline in the price of veggie burgers

An increase in the price of tofu burgers, perceived as a substitute by veggie burger consumers

An increase in the price of burger buns

A technological innovation that lowers the cost of producing veggie burgers

2. Suppose each of the seven dwarfs buys four mugs of ginger ale per week from Snow White's café, when the price per mug is $2. If the seven dwarfs are the entire market demand for Snow White's ginger ale, which of the following is the correct value for market quantity demanded of ginger ale per week at a price of $2?

SHOW ANSWER

SHOW ANSWER

SHOW ANSWER

4

8

28

3. Which of the following increases the supply of corn?

SHOW ANSWER

SHOW ANSWER

SHOW ANSWER

The farm workers' union successfully negotiates a pay increase for corn harvest workers.

The Surgeon General announces that eating corn contributes to heart disease.

Congress and the president eliminate subsidies formerly paid to corn farmers.

Farmers who grow soybeans can also grow corn, and the price of soybeans drops by 75 percent.

4. With an upward-sloping supply curve, which of the following is *true*?

SHOW ANSWER

SHOW ANSWER

SHOW ANSWER

An increase in price results in a decrease in quantity supplied.

An increase in price results in an increase in supply.

A decrease in price results in a decrease in quantity supplied.

A decrease in price results in an increase in supply.

5. A surplus occurs when

SHOW ANSWER

SHOW ANSWER

SHOW ANSWER

the quantity demanded exceeds the quantity supplied.

price is below the equilibrium price.

price is at the equilibrium.

price is above the equilibrium.

Chapter 4. Markets in Action

Chapter Objectives

1. Explain why the competitive market outcome is efficient.
2. Describe sources of market failure.
3. Analyze the impact of price controls on market efficiency.
4. Describe how policies can be used to correct the impacts of externalities on market efficiency.

Introduction

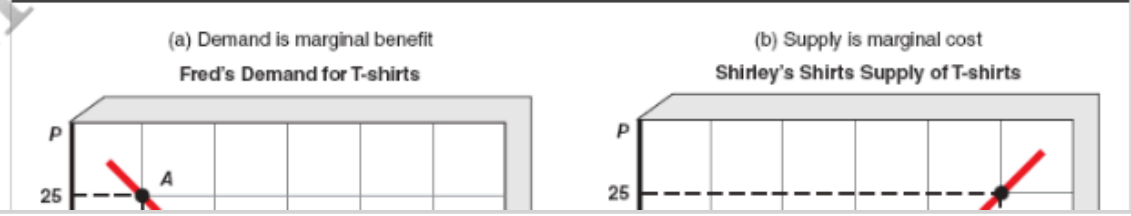
In chapter 3, we saw how markets achieve equilibrium. We begin chapter 4 by showing that in a competitive market, this equilibrium is an efficient use of our resources. We go on to explore situations where the market fails to achieve this outcome as well as the consequences of government policies aimed at controlling markets.

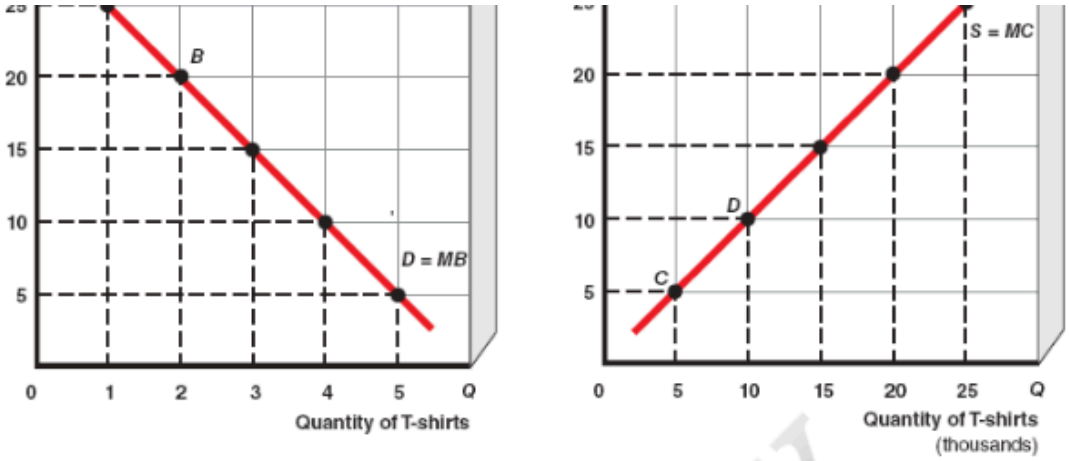
4-1. Market Efficiency

In chapter 2, we learned that economists use the term *efficiency* to describe a situation where society is "doing the best it can" with its existing resources and technology. A rational decision maker decides on an option only if the marginal benefit (which is determined by consumer preferences) exceeds the marginal cost (opportunity cost). This means that society should continue to allocate resources to the production of a good as long as the marginal benefit of doing so is greater than the marginal cost, and society should stop allocating more resources to the production of that good when the marginal benefit of doing so is just equal to the marginal cost. Moreover, if the marginal benefit from a good is less than its marginal cost of production, then less of the good should be produced and fewer resources devoted to its production. We will now show that efficiency is achieved from a competitive market equilibrium.

Exhibit 1 illustrates how a demand curve represents a consumer's marginal benefit. A demand curve shows the different quantities of a product consumers are willing to purchase at various prices. In part (a), we reproduce Fred's demand curve for T-shirts from chapter 3. Point A shows, for example, that at a
79 price of $25, Fred would purchase 1 T-shirt. This means that Fred is willing to pay $25 for the first T-shirt. Willingness to pay represents the value, or benefit, Fred receives from that T-shirt. Fred would be willing to pay $20 for a second T-shirt (point B), so the marginal, or incremental, benefit of the second T-shirt is $20. The demand curve, then, represents Fred's marginal benefit of T-shirts. Recall that the market demand is the horizontal sum of the quantities demanded by all consumers in the market at various prices and, as such, represents the overall marginal benefit (MB) to society of T-shirts, sometimes referred to as the marginal social benefit.

Exhibit 1 Demand Is Marginal Benefit; Supply Is Marginal Cost





▸ Details

Fred's demand for T-shirt curve shows Fred's wiliness to purchase T-shirts at various prices. For example, Point A in part (a) shows that at a price of $25, Fred would purchase 1 T-shirt. In other words, Fred is willing to pay $25 for the first T-shirt. Willingness to pay reflects the value, or benefit, Fred receives from that T-shirt. Fred would be willing to pay $20 for the second T-shirt. Because demand represents Fred's willingness to pay, it also measures the marginal benefit.

Part (b) shows the supply curve for Shirley's Shirts, one firm in the T-shirt industry. Sellers are only willing to offer a product for sale if they can cover the opportunity cost of doing so. At $5 (Point *C*), Shirly is willing to produce 5,000 shirts. To produce 10,000 shirts, she would require $10 per shirt (point *D*) to cover the increasing opportunity cost (marginal cost) of increased production. The supply curve, then, represents the marginal cost of production.

A supply curve shows the different quantities of a product sellers are willing to produce and offer for sale at various prices. Sellers are only willing to offer a product for sale if they can cover the marginal cost (MC) of doing so. In part (b), we

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- there is an overproduction of tricycles, and the market is inefficient.
- the current production level is efficient.
- there is an underproduction of tricycles, and the market is efficient.

4-2. Sources of Market Failure

In the previous chapter, you gained an understanding of how markets operate. Through the price system, society coordinates economic activity, and in a well-functioning competitive market, resources are allocated efficiently through this system. But markets do not always achieve *market efficiency*. Sometimes markets result in a misallocation of resources. **Market failure** occurs when market equilibrium results in too few or too many resources being used in the production of a good or service. In this section, you will study three important cases of market failure: lack of competition, externalities, and public goods.

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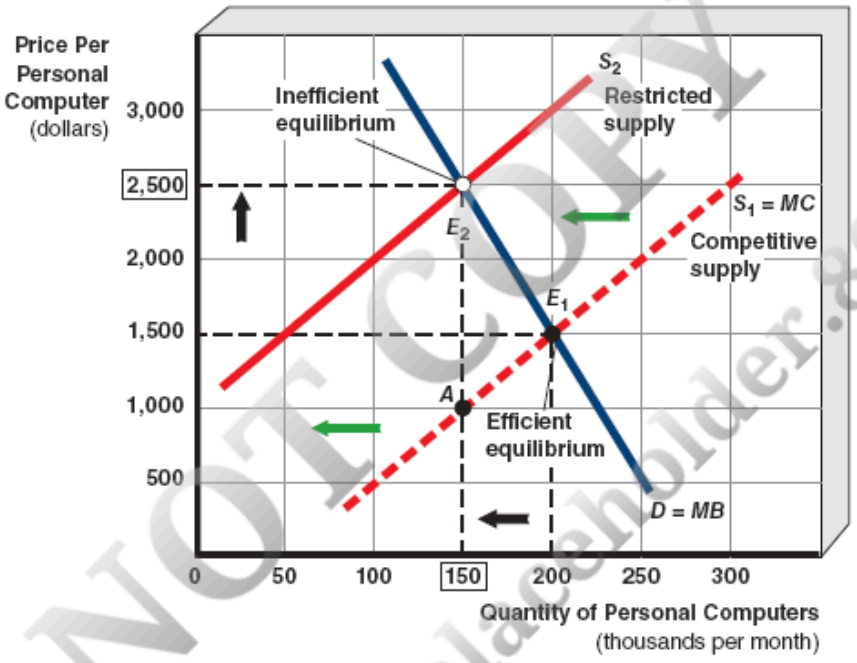
4-2a. Lack of Competition

There must be competition among both producers and consumers for markets to function properly. But what happens if the producers fail to compete? In *The Wealth of Nations*, Adam Smith stated, "People of the same trade seldom meet together, even for merriment and diversion, but the conversation ends in a conspiracy against the public, or in some diversion to raise prices." This famous quote underscores the fact that in the real world, businesses seek ways to replace consumer sovereignty with "big business sovereignty." What happens when a few firms rig the market and become the market's boss? By restricting supply through artificial limits on the output of a good, firms can enjoy higher prices and profits. As a result, firms may waste resources and slow technology and innovation.

Exhibit 3 illustrates how IBM, Apple, Gateway, Dell, and other suppliers of personal computers (PCs) could benefit from rigging the market. S_1 shows the supply

curve when sellers compete and, as shown in the previous section, reflects the marginal cost of production. At point E_1, the competitive price for PCs is $1,500, the quantity of 200,000 per month is sold, and market efficiency (MB = MC) prevails. Sellers, however, can increase profits by taking steps that would make PCs artificially scarce and raise the price. Graphically, the sellers wish to shift the competitive supply curve, S_1, leftward to the restricted supply curve, S_2. This could happen for a number of reasons, including an agreement among sellers to restrict supply (collusion).

Exhibit 3 Rigging the PC Market



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When sellers compete, equilibrium occurs at point E_1. The price charged per PC is $1,500, and the quantity of PCs exchanged is 200,000. This is an efficient level of production because MB = MC. Suppose, however, suppliers use collusion or other means to restrict the supply of this product. The decrease in supply from S_1 to S_2 establishes an inefficient market equilibrium E_2. At E_2, firms charge the higher price of $2,500, and the equilibrium quantity of PCs falls to 150,000. Marginal benefit (point E_2) exceeds marginal cost (point A)and the market fails because firms use too few resources to produce fewer than the optimal number of PCs while charging an artificially high price.

Although the producers benefit by artificially restricting supply and raising the price (point E_2), the lack of competition means the economy loses. When only

150,000 PCs are sold, the marginal benefit of the last unit sold ($2,500 at point E_2) exceeds the marginal cost ($1,000 at point A), and too few resources are devoted to producing PCs. Note that under U.S. antitrust laws, the Department of Justice is responsible for prosecuting firms that collude to restrict supply to force higher prices.

Take Note

If firms are able to reduce competition by colluding to restrict supply, then will result an inefficient equilibrium with an artificially high price and too few resources devoted to the production of the good.

4-2b. Externalities

Even when markets are competitive, some markets may still fail because they suffer from the presence of side effects economists call externalities. An **externality** is a cost or benefit imposed on people other than the consumers and producers of a good or service. Externalities are also called *spillovers, spillover effects*, or *neighborhood effects*. People other than consumers and producers who are affected by these side effects of market exchanges are called *third parties*. Externalities may be either negative or positive; that is, they may be detrimental or beneficial. Suppose you are trying to study, and your roommate is listening to Steel Porcupines at full blast. The action of your roommate is imposing an unwanted *external cost* or *negative externality* on you and other third parties who are trying to study or sleep. Externalities can also result in an *external benefit* or *positive externality* to nonparticipating parties. When a community proudly displays its neat lawns, gorgeous flowers, and freshly painted homes, visitors are third parties who did none of the work but enjoy the benefit of the pleasant scenery.

A Graphical Analysis of Pollution

Exhibit 4 provides a graphical analysis of two markets that fail to include

externalities in their market prices unless the government takes corrective action. Exhibit 4(a) shows a market for steel in which steel firms burn high-sulfur coal and pollute the environment. Demand curve *D* and supply curve S_1 establish the inefficient equilibrium, E_1, in the steel market. Not included in S_1 are the *external costs* to the public because the steel firms are not paying for the damage from smoke emissions. If steel firms discharge smoke and ash into the atmosphere, foul air reduces property values, raises health care costs, and generally erodes the quality of life. Because supply curve S_1 does not include these external costs, they are also not included in the price of steel, P_1. At Q_1 units of production, there is an overallocation of resources to this market as the full marginal cost of production (point A) exceeds the marginal benefit (E_1). In short, the absence of the cost of pollution in the price of steel means the firms produce more steel and pollution than is socially desirable.

A Graphical Analysis of COVID-19 Vaccinations

In our previous example, the supply curve did not include the *external costs* of a product. Now you will see that the demand curve may not include the *external benefits* of a product. Consider the vaccinations created to protect against COVID-19. Exhibit 4(b) illustrates this market. Demand curve D_1 reflects the price consumers would pay for shots to receive the benefit of a reduced probability of infection. Supply curve *S* shows the quantities of shots suppliers offer for sale at different prices.

At equilibrium point E_1, the market fails to achieve an efficient allocation of resources. The reason is that when buyers are vaccinated, other people who do not purchase shots (called *free riders*) also benefit because this disease is less likely to spread to them. Demand curve D_2 includes external benefits to nonconsumers of vaccinations and therefore represents the full marginal benefit to society. At Q_1, the marginal benefit (point *B*) exceeds the marginal cost resulting in an underallocation of resources. At E_2, the efficient equilibrium, sellers devote greater resources to vaccinations, and the underallocation of resources would be eliminated. Later in this chapter we discuss the impact of government intervention in the market for vaccinations.

Take Note

When the demand curve fails to include external benefits, the equilibrium price is artificially low, and the equilibrium quantity is artificially low. External benefits cause the market to underallocate resources.

Am I on Track?

2. When there are external costs associated with the production of a good, the market equilibrium price will be artificially

good, the market equilibrium price will be artificially

_____ and the market equilibrium quantity will be artificially _____ .

SHOW ANSWER

SHOW ANSWER

SHOW ANSWER

a. high; high

b. high; low

c. low; high

d. low; low

4-2c. Public Goods

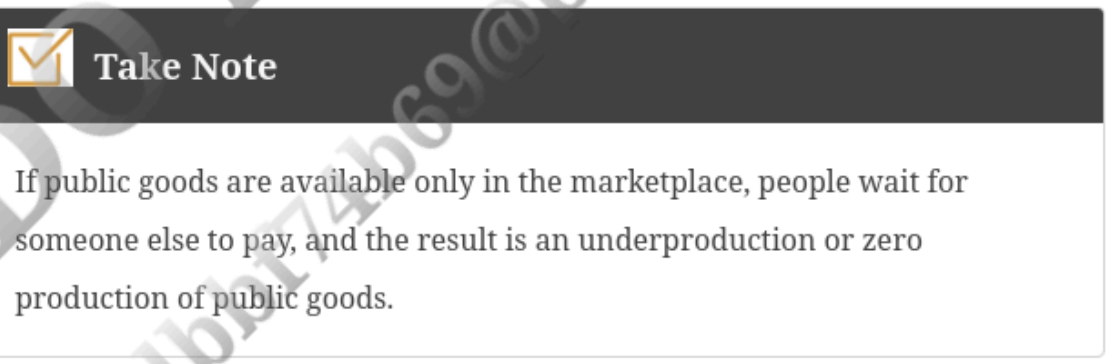
Private goods are produced through the price system. In contrast, national defense is an example of a public good provided by the government because of its special characteristics. A **public good** is a good or service that, once produced, has two properties:

1. Users collectively consume the benefits and
2. There is no way to bar people who do not pay (*free riders*) from consuming the good or service.

To see why the marketplace fails to produce the optimal amount of a public good or service, imagine that Patriot Missiles Inc. offers to sell missile defense systems

to people who want private protection against attacks from incoming missiles. First, once the system is operational, everyone in the defended area benefits from increased safety. Second, the *nonexclusive* nature of a public good means it
86 is impossible or very costly for any owner of a Patriot missile defense system to prevent nonowners, the free riders, from reaping the benefits of its protection.

Given the two properties of a public good, why would any private individual purchase a Patriot missile defense system? Why not wait until someone else buys a missile system and take a free ride? Each person wants a Patriot system but does not want to bear the cost of the system when everyone shares in the benefits. As a result, the market fails to provide Patriot missile defense systems, and everyone hopes no missile attacks occur before someone finally decides to purchase one. Government can solve this public goods problem by producing Patriot missiles and taxing the public to pay for them. Unlike a private citizen, the government can use force to collect payments and prevent the free-rider problem. Other examples of public goods include global agreements to reduce emissions, the judicial system, the national emergency warning system, air traffic control, prisons, dams, city roads, police and fire protection, and traffic lights.



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Take Note

If public goods are available only in the marketplace, people wait for someone else to pay, and the result is an underproduction or zero production of public goods.

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Take Note

If public goods are available only in the marketplace, people wait for someone else to pay, and the result is an underproduction or zero production of public goods.

4-3. Policies to Correct Market Failure

The government intervenes in some markets to correct for the market failures just described. Here, we discuss three potential tools it can use to influence the market:

1. Regulation
2. Price Controls
3. Taxes and Subsidies

4-3b. Price Controls

The government intervenes in some markets with the objective of preventing prices from rising to their market equilibrium level. In other markets, the government's goal is to intervene and maintain a price higher than the market equilibrium price. We now consider what happens when the government sets prices. There are two types of price controls: *price ceilings* and *price floors*.

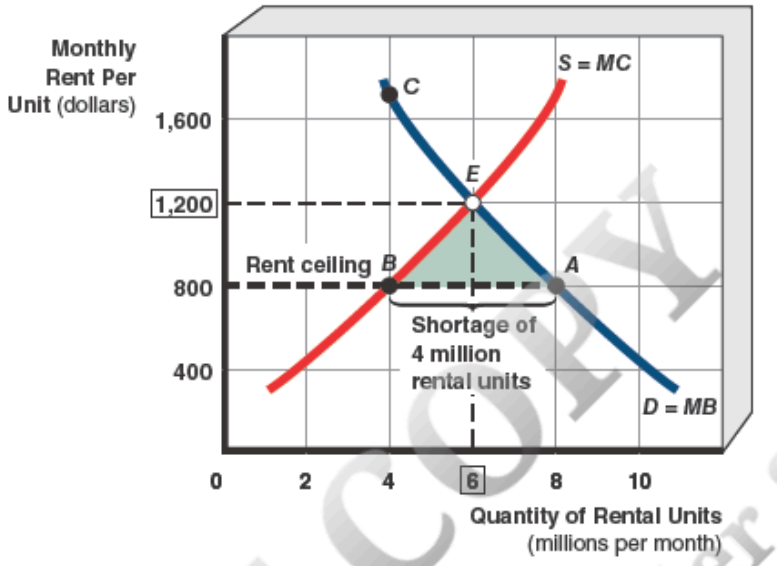
Price Ceilings

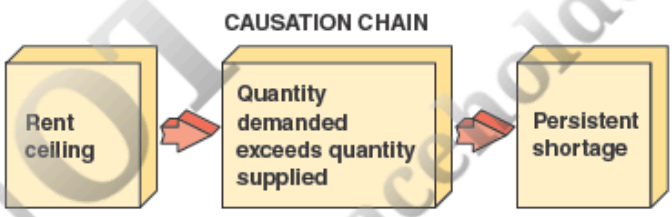
What happens if the government prevents the price system from setting a market price "too high" by mandating a price ceiling? A **price ceiling** is a legally established maximum price a seller can charge. Rent controls are an example of the imposition of a price ceiling in the market for rental units. New York City, Washington, D.C., Los Angeles, San Francisco, and other communities in the United States have some form of rent control. Since World War I, rent controls have been widely used in Europe. The rationale for rent controls is to provide an "essential service" that would otherwise be unaffordable by many people at the equilibrium rental price. Let's see why rent controls may be counterproductive.

Exhibit 5 shows the quantity of rental units demanded and supplied per month in a hypothetical city. We begin the analysis by assuming no rent controls exist and equilibrium is at point *E*, with a monthly rent of $1,200 per month and 6 million units occupied. Notice that at *E*, MB = MC, and the market is efficient. Next, assume the city council imposes a rent control (ceiling price) that, by law, forbids any landlord from renting a unit for more than $800 per month. What does market supply and demand theory predict will happen? At the low rent ceiling of $800, the quantity demanded of rental units will be 8 million, but the quantity supplied will be only 4 million. Consequently, the price ceiling creates a persistent market shortage of 4 million rental units because suppliers cannot raise the rental price without being subjected to legal penalties. At 4 million rental units sold, marginal benefit (point C) exceeds marginal cost (point B), and the rent control has created an inefficiency in the market (an underallocation of

resources devoted to rental housing).

Exhibit 5 Rent Control Results in a Shortage of Rental Units





▸ Details

If no rent controls exist, rent for a hypothetical apartment is $1,200 per month at the efficient equilibrium point *E* (MB = MC). However, if the government imposes a rent ceiling of $800 per month, quantity demanded (point *A*) will exceed quantity supplied (point *B*) and a persistent shortage of 4 million rental units occurs. A market inefficiency is created as marginal benefit (point *C*) exceeds marginal cost (point *B*). Because rent cannot rise by law, one outcome is that consumers must search for available units instead of paying a higher rent. Other outcomes include a black market, bribes, discrimination, and other illegal methods of dealing with a shortage of 4 million rental units per month.

Note that a rent ceiling at or above $1,200 per month would have no effect. If the ceiling is set at the equilibrium rent of $1,200, the quantity of rental units demanded and the quantity of rental units supplied are equal regardless of the

rent control. If the rent ceiling is set above the equilibrium rent, the quantity of rental units supplied exceeds the quantity of rental units demanded, and this surplus will cause the market to adjust to the equilibrium rent of $1,200.

What is the impact of rent controls on consumers? First, as a substitute for paying higher prices, consumers may spend more time on waiting lists and searching for housing. This means that consumers incur an *opportunity cost* added to the $800 rent set by the government. Second, an illegal market, or *black market*, can arise because of the excess quantity demanded. Because the price of rental units is artificially low, the profit motive encourages tenants to risk breaking the law by subletting their unit to the highest bidder over $800 per month.

From the seller's perspective, rent control encourages two undesirable effects. First, faced with a mandated low rent, landlords may cut maintenance expenses, and housing deterioration will reduce the stock of rental units in the long run. Second, landlords may use discriminatory practices to replace the price system. Once owners realize there is an excess quantity demanded for rentals at the controlled price, they may resort to preferences based on pet ownership or family size to determine how to allocate scarce rental space.

minimum wage is that the number of workers willing to offer their labor increases upward along the supply curve to Q_s, but there are fewer jobs because the number of workers firms are willing to hire decreases to Q_d on the demand curve. The predicted outcome is a labor surplus of unskilled workers, $Q_s - Q_d$, who are unemployed. Moreover, employers are encouraged to substitute machines and skilled labor for the unskilled labor previously employed at the equilibrium wage, W_e. Ironically, when a minimum wage is enacted, employers lay off some of the lowest-skilled workers, exactly the type of workers minimum wage legislation intends to help.

While some unemployment is a drawback of the minimum wage, those workers that are still employed, Q_d, are better off. Moreover, when their additional income is spent, it generates more sales, more production, and some job creation that can offset at least some of the initial unemployment over a period of time. Even though the minimum wage causes a reduction in employment (at least in the short run), some economists argue that a more equal or fairer income distribution is worth the loss of some jobs. Moreover, the shape of the labor demand curve may be much more vertical than shown in Exhibit 6. If this is the case, the unemployment effect of a rise in the minimum wage would be small. In addition, it is possible the minimum wage may empower unskilled workers, who often lack bargaining power with employers, in obtaining higher wages.

Finally, a minimum wage set at or below the equilibrium wage rate is ineffective. If the minimum wage is set at the equilibrium wage rate of W_e, the quantity of labor demanded and the quantity of labor supplied are equal regardless of the minimum wage. If the minimum wage is set below the equilibrium wage, the forces of supply of and demand for labor establish the equilibrium wage regardless of the minimum wage rate.

Take Note

A price floor establishes a minimum price a seller can charge and results in a surplus in the market. A minimum wage is an example of a price floor in the labor market and the surplus that results is unemployment.

Am I on Track?

3. Unemployment results when the government imposes:

SHOW ANSWER

SHOW ANSWER

SHOW ANSWER

a. a price ceiling above the equilibrium wage in the labor market.

b. a price ceiling below the equilibrium wage in the labor market.

c. a price floor above the equilibrium wage in the labor market.

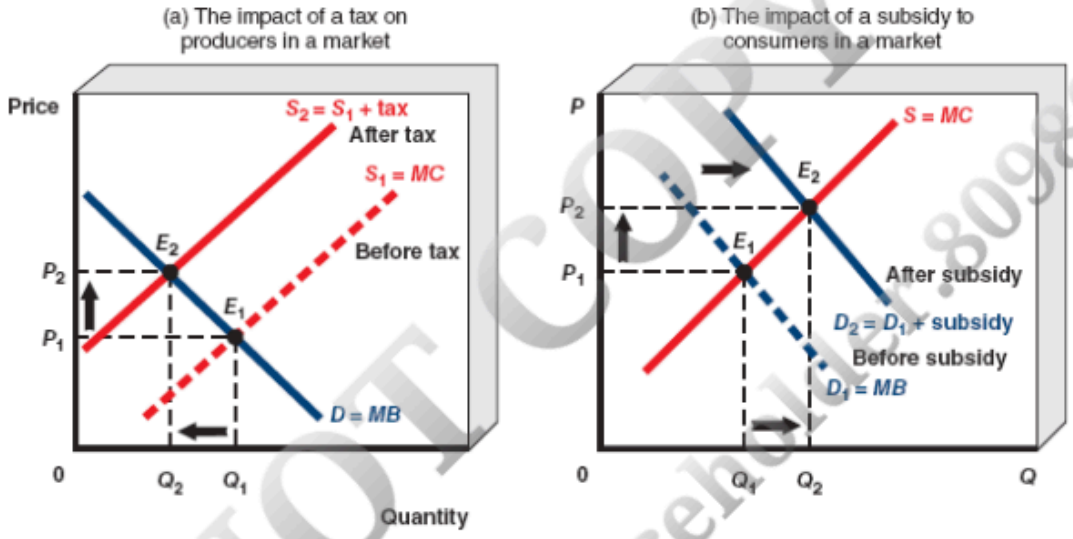
d. a price floor below the equilibrium wage is in the labor market.

4-3c. Taxes and Subsidies

Another approach the government can take to correct for market failures is to use taxes and subsidies to alter the costs and benefits in a market. Exhibit 7 shows the effect of each. In part (a), the government taxes producers for each unit sold, which adds to the cost of production and shifts the supply curve leftward from S_1 to S_2 . The equilibrium moves from E_1 to E_2 which raises the price and reduces the quantity in the market. In part (b), the government

subsidizes (pays) consumers for each unit purchased, which increases the benefits from consumption and shifts the demand curve rightward from D_1 to D_2. The equilibrium moves from E_1 to E_2 which raises the price and increases the quantity in a market. How can the use of taxes and subsidies counteract market failures?

Exhibit 7 The Impact of a Tax or Subsidy in a Market



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Part (a) shows what happens when the government taxes producers for each unit sold. The supply curve shifts leftward from S_1 to S_2 as the tax adds to the cost of production. The equilibrium moves from E_1 to E_2 which raises the price and reduces the quantity in the market. In part (b), the government subsidizes (pays) consumers for each unit purchased. This increases the benefits from consumption and shifts the demand curve rightward from D_1 to D_2. The equilibrium moves from E_1 to E_2 which raises the price and increases the quantity in a market.

A Closer Look Applicable Concept: Public Goods versus Private Goods

Can Vouchers Fix Our Schools?

In their book *Free to Choose*, published in 1980, economists Milton

In their book *Free to Choose*, published in 1980, economists Milton Friedman and his wife Rose Friedman proposed a voucher plan for schools. The objective of their proposal was to retain government financing but give parents greater freedom to choose the schools their children attend. The Friedmans pointed out that under the current system, parents face a strong incentive not to remove their children from the public schools. The reason is because if parents decide to withdraw their children from a public school and send them to a private school, they must pay private tuition in addition to the taxes that finance children enrolled in the public schools.

To remove the financial penalty that limits the freedom of parents to choose schools, the government could give parents a voucher, which is a piece of paper redeemable for a sum of money payable to any approved school. For example, if the government spends $8,000 per year to educate a student, then the voucher could be for this amount. The voucher plan embodies the same principle as the GI Bill that provides educational benefits to military veterans. The veteran receives a voucher good only for educational expenses and is free to choose the school where it is used, provided the school satisfies certain standards.

The Friedmans argue that parents could, and should, be permitted to use the vouchers not only at private schools but also at other public schools—and not only at schools in their own district, city, or state, but at any school that is willing to accept their child. That option would give every parent a greater opportunity to choose and at the same time would require public schools to charge tuition. The tuition would be competitive because public schools must compete for students both with other public schools and with private schools. It is important to note that this plan relieves no one of the burden of taxation to pay for schooling. It simply gives parents a wider choice as to which competing schools their children can attend, given the amount of funding per student that the community has obligated itself to provide. The plan also does not affect the present standards imposed on private schools to ensure that students attending them satisfy the compulsory attendance laws.

compulsory attendance laws.

In 1990, Milwaukee began an experiment with school vouchers. The program gave selected children from low-income families taxpayer-funded vouchers to allow them to attend private schools. There has been a continuing heated debate among parents, politicians, and educators over the results. In 1998, Wisconsin's highest court ruled in a 4-2 decision that Milwaukee could use public money for vouchers for students who attend religious schools without violating the constitutional separation of church and state.

A 2002 article in *USA Today* reported:

> Opponents of vouchers have repeatedly argued that they would damage the public schools, draining them of resources and better students. A recent study of the Milwaukee voucher program by Caroline Hoxby, a Harvard economist, suggests just the opposite. She wrote that "schools that faced the most potential competition from vouchers had the best productivity response." No doubt, the nation's experience with vouchers is limited, yet the evidence cited in a recent Brookings Institution report shows that they do seem to benefit African American youngsters.

Marjorie Kamys Cotera/Bob Daemmrich Photography/Alamy Stock Photo

▸ Details

Marjorie Kamys Cotera/Bob Daemmrich Photography/Alamy Stock Photo

Marjorie Kamys Cotera/Bob Daemmrich Photography/Alamy Stock Photo

The controversy continues: For example, in a 2002 landmark case, the U.S. Supreme Court ruled that government vouchers for private or parochial schools are constitutional. In 2003, however, a Denver judge struck down Colorado's new school voucher law, ruling that it violated the state's constitution by stripping local school boards of their control over education. In 2006, the Florida Supreme Court ruled that Florida's voucher program for students in the lowest-rated public schools was unconstitutional. Then, in 2010, Florida legislated a tax-credit voucher plan for low-income students. In 2013, the Indiana Supreme Court upheld the state's voucher program, which is the nation's broadest school voucher program. And in the 2014–2015 school year, North Carolina awarded vouchers to students whose families meet certain income requirements. In 2017, a renewed debate was sparked by President Trump's appointment of Betsy DeVos, a long-time supporter of school vouchers, as Secretary of Education.

Consider the market for Steel once again in Exhibit 4 part (a). Recall that when producers do not consider the external cost of pollution, equilibrium E_1 results and they produce more output, Q_1, than the efficient level of output, Q_2, where the marginal benefit equals the full marginal social cost of production (point E_2). Consider what happens if the government levies a tax per ton of steel equal to the external cost imposed on society when the firm emits pollution into the air. The additional production cost per ton of steel from the pollution tax shifts the supply curve leftward from S_1 to S_2 as shown and production (and the pollution) is reduced. Again, the objective is to change the equilibrium from E_1 to E_2 and eliminate the overallocation of resources devoted to steel production. The tax revenue could be used to compensate those damaged by the pollution.

What about the market failure that resulted in an underproduction of COVID-19 vaccinations in Exhibit 4 part (b)? The government could shift the demand curve rightward by providing a subsidy to consumers by paying each citizen a dollar

payment equal to the amount of external benefits per shot received. The rightward shift of the demand curve increases price and quantity until the efficient equilibrium price and quantity are reached. The greater quantity produced corrects for the underallocation of resources devoted to the vaccine.

Key Terms

Price ceiling

Market failure

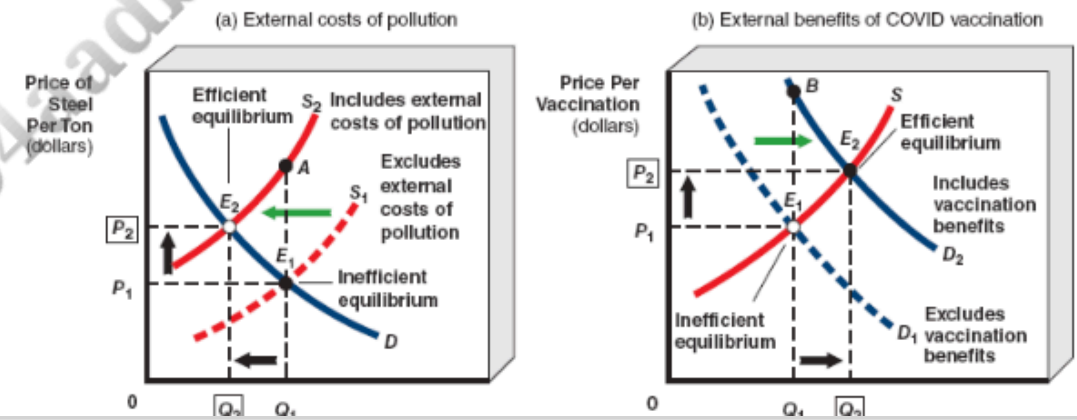
Externality

Public good

Price floor

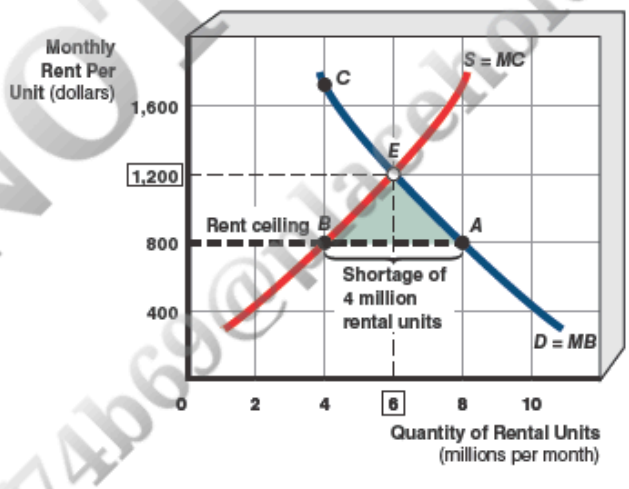
Summary

- Market failure occurs when the market mechanism does not achieve an efficient allocation of resources. Sources of market failure include a lack of competition, externalities, and public goods. Although controversial, government intervention is a possible way to correct market failure.
- An externality is a cost or benefit of a good imposed on people who are not buyers or sellers of that good. Pollution is an example of an *external cost*, which means too many resources are used to produce the product responsible for the pollution. Two basic approaches to solve this market failure are regulation and pollution taxes. Vaccinations provide *external benefits*, which means sellers devote too few resources to producing this product. Two basic solutions to this type of market failure are laws to require the consumption of shots and special subsidies.



▸ Details

- Public goods are goods that are consumed by all people in a society regardless of whether they pay or not. National defense, air traffic control, and other public goods can benefit many individuals simultaneously and are provided by the government.
- Price ceilings and price floors are maximum and minimum prices enacted by law, instead of allowing the forces of supply and demand to determine prices. A *price ceiling* is a maximum price mandated by government, and a *price floor*, or *support price*, is a minimum legal price. If a price ceiling is set below the equilibrium price, a shortage will persist. If a price floor is set above the equilibrium price, a surplus will persist.



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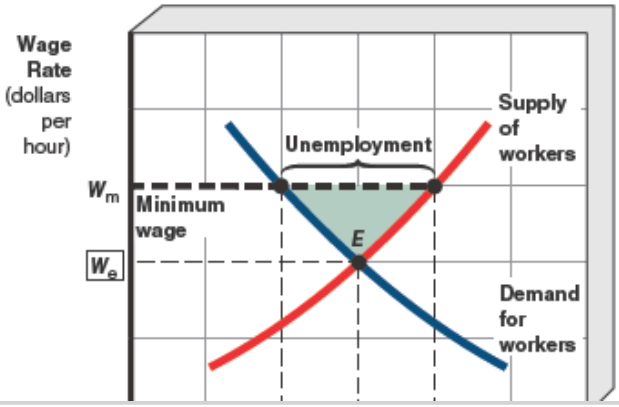

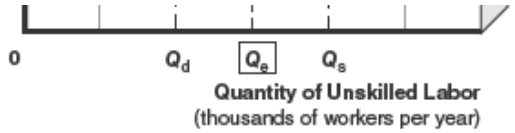

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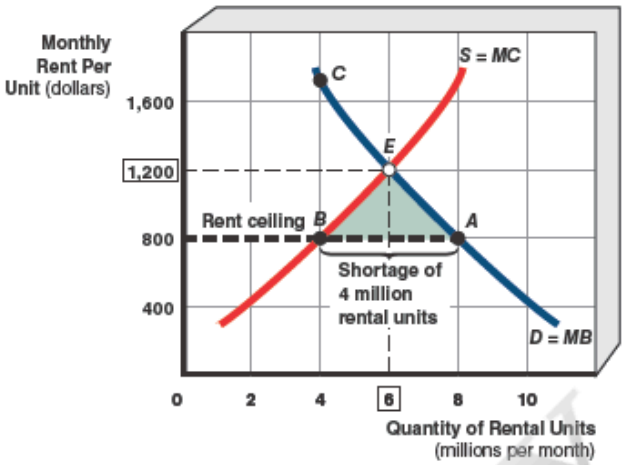

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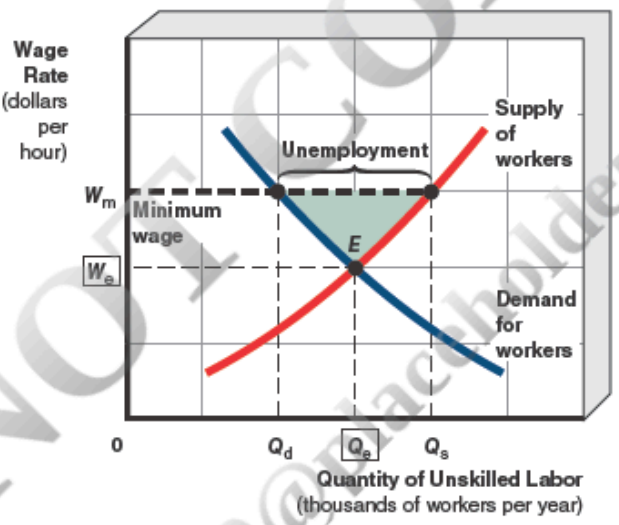

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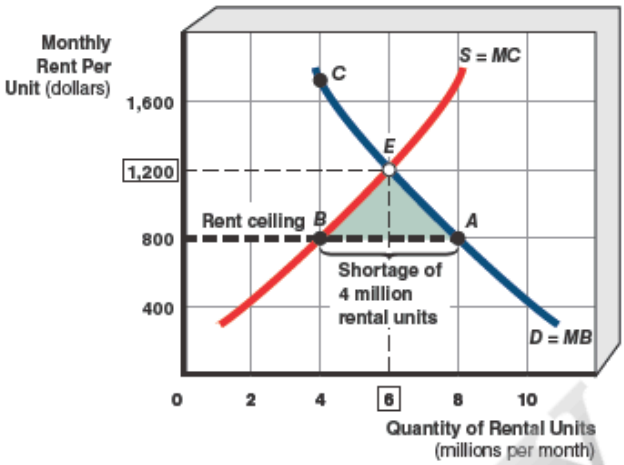

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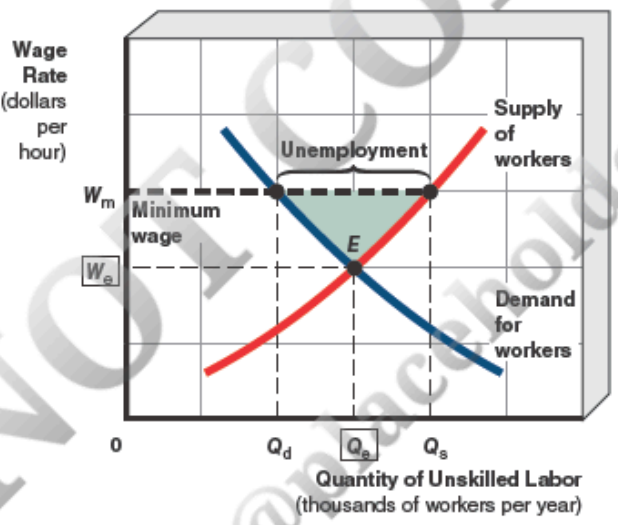

▸ Details

Take Note Revisited

- The demand curve, which shows the consumers' willingness to pay for a product, is the marginal benefit curve. The supply curve, which shows the minimum price necessary for producers to cover the opportunity cost of production and be willing to offer a product for sale, is the marginal cost curve.

- The competitive market equilibrium is efficient because at that level of production, the marginal benefit of consumption is just equal to the

production, the marginal benefit of consumption is just equal to the marginal cost of production.

- If firms are able to reduce competition by colluding to restrict supply, then an inefficient equilibrium will result with an artificially high price and too few resources devoted to the production of the good.
- When the supply curve fails to include external costs, the equilibrium price is artificially low, and the equilibrium quantity is artificially high. External costs cause the market to overallocate resources.
- When the demand curve fails to include external benefits, the equilibrium price is artificially low, and the equilibrium quantity is artificially low. External benefits cause the market to underallocate resources.
- If public goods are available only in the marketplace, people wait for someone else to pay, and the result is an underproduction or zero production of public goods.
- A price ceiling, such as a rent control, establishes a maximum price a seller can charge and results in a shortage in the market.
- A price floor establishes a minimum price a seller can charge and results in a surplus in the market. A minimum wage is an example of a price floor in the labor market and the surplus that results is unemployment.

Sample Quiz

Please see Appendix B for answers to Sample Quiz questions.

1. The competitive equilibrium is efficient because at that level of output,

SHOW ANSWER

SHOW ANSWER

SHOW ANSWER

a. the marginal benefit of consuming the last unit exchanged exceeds the marginal cost of producing it.

b. the marginal benefit of consuming the last unit exchanged equals the marginal cost of producing it.

c. the marginal benefit of consuming the last unit exchanged is less than the marginal cost of producing it.

d. the cost of production is zero.

2. Which of the following terms describes a situation in which society is "doing the best it can" with its existing resources and technology?

SHOW ANSWER

SHOW ANSWER

SHOW ANSWER

a. Market failure

b. Externality

c. Efficiency

d. Public good

3. Assume no price ceiling exists in a market. Then, a price ceiling is established below the market equilibrium. What would result?

SHOW ANSWER

SHOW ANSWER

SHOW ANSWER

a. Shortage

b. Equilibrium

c. Surplus

d. Exchange price

4. Which of the following is *not* an example of market failure?

SHOW ANSWER

SHOW ANSWER

SHOW ANSWER

SHOW ANSWER

a. Lack of competition

b. Externalities

c. Efficient equilibrium

d. Public goods

5. A cost imposed on people other than the consumers of a good or service is a

SHOW ANSWER

SHOW ANSWER

SHOW ANSWER

a. price floor.

b. negative externality.

c. positive externality.

d. price ceiling.

6. A supply curve represents

SHOW ANSWER

SHOW ANSWER

SHOW ANSWER

a. the marginal benefit of consumption.

b. the marginal cost of production.

c. the external benefit of consumption.

d. the external cost of production.

7. A demand curve represents

SHOW ANSWER

SHOW ANSWER

SHOW ANSWER

a. the marginal benefit of consumption.

b. the marginal cost of production.

c. the external benefit of consumption.

d. the external cost of production.

8. Which of the following results when too many resources are devoted to the production of a good?

SHOW ANSWER

SHOW ANSWER

SHOW ANSWER

a. Penalties will be imposed by the government.

b. The marginal benefit will exceed the marginal cost of the last unit exchanged.

c. The marginal benefit will equal the marginal cost of the last unit exchanged.

d. The marginal cost will exceed the marginal benefit of the last unit exchanged.

9. In a market with external costs such as pollution, the government may intervene to overcome market inefficiencies by

SHOW ANSWER

SHOW ANSWER

SHOW ANSWER

a. paying a per unit subsidy to producers equal to the external

cost per unit.

b. imposing a per unit tax on producers equal to the external cost.

c. regulating the market to require producers increase their production.

d. enacting laws requiring consumers purchase more of the product.

10. Which of the following terms describes a good or service where users collectively consume benefits and there is no way to bar people who do not pay (free riders) from consuming the good or service?

SHOW ANSWER

SHOW ANSWER

SHOW ANSWER

a. Public good

b. Private good

c. Competitive good

d. Rival good

11. If a price ceiling is set at $10, and the equilibrium market price is $8, which price will consumers actually pay?

SHOW ANSWER

SHOW ANSWER

SHOW ANSWER

a. $10

b. $8

c. $18

d. $2

12. Suppose the state of California imposes a minimum wage of $20 per hour. In the entry-level labor market in California fast-food restaurants, the quantity of labor demanded at $20 per hour is 800,000, and the quantity of labor supplied is 1.2 million. Which of the following is true?

SHOW ANSWER

SHOW ANSWER

SHOW ANSWER

a. There is a shortage of 800,000 workers in the labor market.

b. There is a surplus of 400,000 workers in the labor market.

c. There is a shortage of 400,000 workers in the labor market.

d. There is a surplus of 1.2 million workers in the labor market.

13. Suppose the federal government imposes a price floor in the milk market at a price of $6 per gallon. If the market quantity demanded at $6 is 1 billion gallons, and market quantity supplied is 1.5 billion gallons, which of the following is true?

SHOW ANSWER

SHOW ANSWER

SHOW ANSWER

a. There is a shortage of 500 million gallons of milk, and the federal government will buy 1 billion gallons to maintain the $6 price.

b. There is a surplus of 500 million gallons of milk, and the federal government will buy these 500 million gallons to maintain the $6 price.

c. There is a shortage of 500 million gallons of milk, and the

c. There is a shortage of 500 million gallons of milk, and the federal government will buy an additional 500 million gallons to maintain the $6 price.

d. There is a surplus of 1 billion gallons of milk, and the federal government will buy 1.5 billion gallons to maintain the $6 price.

14. Suppose the city of Arcata, California, imposes rent control so rents cannot exceed $1,000 per month on one-bedroom rental units. Suppose $1,000 had also been the equilibrium rental price in Arcata before a huge new apartment complex was built in the nearby town of McKinleyville, where rents are $800 per month. Which of the following is *most* likely true?

SHOW ANSWER

SHOW ANSWER

SHOW ANSWER

a. There will be a shortage of rental housing in Arcata at the rent control price of $1,000.

b. There will be a lasting surplus of rental housing in Arcata after the new apartment complex is built in McKinleyville.

c. The equilibrium rental price in Arcata will fall below $1,000;

thus, rent control will not affect the rental market in Arcata.

d. The equilibrium price of $1,000 per month in Arcata will not change.

15. Suppose the federal government provides wheat farmers with a price floor above the market equilibrium price of wheat, creating a surplus. Which of the following causes a reduction in the surplus of wheat?

SHOW ANSWER

SHOW ANSWER

SHOW ANSWER

a. Elimination of the price floor

b. An increase in the price of wheat

c. A decrease in the demand for wheat

d. An increase in the supply of wheat

16. If society allows firms to freely pollute the environment, which of the following is *true*?

SHOW ANSWER

SHOW ANSWER

SHOW ANSWER

SHOW ANSWER

a. Market equilibrium output will be too high relative to the efficient output level.

b. Market equilibrium output will be too low relative to the efficient output level.

c. Market equilibrium output will be equivalent to the efficient output level.

d. The efficient output level can be achieved by giving firms a subsidy for the pollution they generate.

17. If there are external benefits for good *X*, which of the following is true?

SHOW ANSWER

SHOW ANSWER

SHOW ANSWER

a. The socially efficient amount of good *X* can be achieved if society taxes consumers of good *X*.

b. The socially efficient amount of good *X* can be achieved if society subsidizes consumers of good *X*.

c. The socially efficient amount of good *X* will be equivalent to

the free market equilibrium quantity.

d. The socially efficient amount of good *X* does not exist.

18. Suppose the federal government imposes a new pollution tax of $0.01 per kilowatt-hour of electricity on coal-fired power producers. Which of the following describes how this tax will affect the market for electricity served by these power plants?

SHOW ANSWER

SHOW ANSWER

SHOW ANSWER

a. Demand for electricity will decrease.

b. Demand for electricity will increase.

c. The supply of electricity will decrease.

d. The supply of electricity will increase.

19. Why don't competitive markets do a good job providing public goods?

SHOW ANSWER

SHOW ANSWER

SHOW ANSWER

a. Because people do not receive benefits from public goods

b. Because firms cannot produce enough goods to satisfy market demand

c. Because public goods generate negative externalities and pollution taxes reduce the incentive for firms to supply public goods

d. Because it is difficult to exclude people from gaining benefits from public goods without paying for them, so market demand does not reflect the benefits to society from the public good

20. Market failure can best be described as a situation where markets do not result in

SHOW ANSWER

SHOW ANSWER

SHOW ANSWER

a. a fair price.

b. an exchange of goods and services.

c. an efficient allocation of resources.

c. an efficient allocation of resources.

d. an equilibrium.

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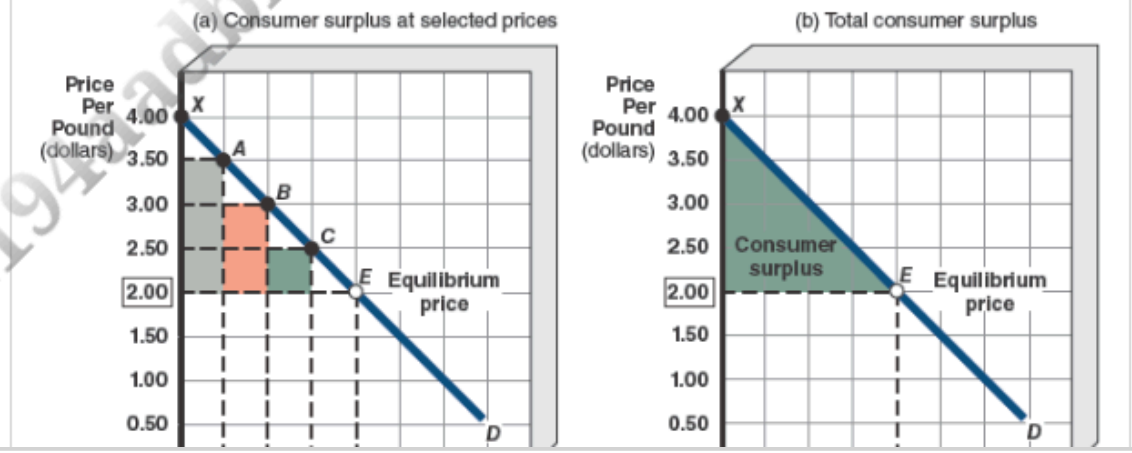
Appendix to Chapter 4. Consumer Surplus, Producer Surplus, and Market Efficiency

Chapter 4 explained how the equilibrium price and quantity determined in a competitive market are desirable because the result is *market efficiency*. Here, we examine efficiency further and use the area shown on a graph between the market price and the demand and supply curves to measure gains or losses from market transactions for consumers and producers.

4A-1. Consumer Surplus

Consider the market demand curve shown in Exhibit A-1(a). As we show, the height of this demand curve shows the maximum willingness of consumers to purchase ground beef at various prices per pound. At a price of $4.00 (point *X*), no one will purchase ground beef. But, if the price drops to $3.50 at point *A*, consumers will purchase 1 million pounds of ground beef per year. Moving downward along the demand curve to point *B*, consumers will purchase an additional million pounds of ground beef per year at the lower price of $3.00 per pound. If the price continues to drop to $2.50 per pound at point *C* and lower, consumers are willing to purchase more pounds of ground beef consistent with the law of demand.

Exhibit A-1 Market Demand Curve and Consumer Surplus



▸ Details

As illustrated in part (a), consumers at point *A* on the market demand curve are willing to pay $3.50 per pound to purchase 1 million pounds of ground beef per year. Since the equilibrium price is $2.00, this means they receive a consumer surplus of $1.50 for each pound of ground beef, and the vertical gray shaded rectangular area is the consumer surplus earned only at point *A*. Others who are willing to pay less at points *B*, *C*, and *E* receive less consumer surplus, and the height of the corresponding rectangles falls at each of these prices. In part (b), moving downward along all possible prices on the demand curve yields the green shaded triangle, which is equal to total consumer surplus (net benefit).

Assuming the market equilibrium price for ground beef is $2.00 per pound, we can use the demand curve to measure the net benefit, or *consumer surplus*, in this market. **Consumer surplus** is the value of the difference between the price consumers are willing to pay for a product on the demand curve and the price actually paid for it. At point *A*, consumers are willing to pay $3.50 per pound, but they actually pay the equilibrium price of $2.00. Thus, consumers earn a surplus of $1.50 ($3.50 – $2.00) per pound, multiplied by 1 million pounds purchased, which is a $1.5 million consumer surplus. This value is represented by the gray shaded vertical rectangle formed at point *A* on the demand curve. At point *B*, consumers who purchase an additional million pounds of ground beef at $3.00 per pound receive a lower extra consumer surplus than at point *A*, represented by a rectangle of lower height. At point *C*, the marginal consumer surplus continues to fall until it reaches equilibrium point *E*, where there is no consumer surplus.

The total value of consumer surplus can be interpreted from the explanation given above. As shown in Exhibit A-1(b), begin at point *X*, and instead of selected prices, now imagine offering ground beef to consumers at each possible price downward along the demand curve until the equilibrium price of $2.00 is

99 reached at point *E*. The result is that the entire green triangular area between the demand curve and the horizontal line at the equilibrium price represents total consumer surplus. Note that a rise in the equilibrium price decreases total consumer surplus, and a fall in the equilibrium price increases total consumer surplus.

Take Note

Consumer surplus is the value of the difference between the price consumers are willing to pay and the price they actually pay for a product. Total consumer surplus is represented by the total area under the market demand curve and above the equilibrium price.

4A-2. Producer Surplus

Similar to the concept of consumer surplus, the height of the market supply curve in Exhibit A-2(a) shows the producers' minimum willingness to accept payment for ground beef offered for sale at various prices per pound. At point *X*, firms offer no ground beef for sale at a price of zero, and they divert their resources to an alternative use. At a price of $0.50 per pound (point *A*), the supply curve tells us that 1 million pounds will be offered

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