In 2011, the price of peanut butter rose by 40 percent. Another price that just keeps rising is that of attending college—tuition. Why do some prices rise? And why do some prices fall, and some fluctuate?

This chapter answers these questions. The demand and supply model that you’re about to study is the main tool of economics. It explains how prices are determined and how they guide the use of resources to influence What, How, and For Whom goods and services are produced.

We’ll return to the rise in the price of peanut butter at the end of the chapter, in Reading Between the Lines. We’ll also apply the demand and supply model to the market for college and explain why tuition keeps rising.

After studying this chapter, you will be able to:

- Describe a competitive market and think about a price as an opportunity cost
- Explain the influences on demand
- Explain the influences on supply
- Explain how demand and supply determine prices and quantities bought and sold
- Use the demand and supply model to make predictions about changes in prices and quantities
Markets and Prices

When you need a new pair of running shoes, want a bagel and a latte, plan to upgrade your cell phone, or need to fly home for Thanksgiving, you must find a place where people sell those items or offer those services. The place in which you find them is a market. You learned in Chapter 2 (p. 44) that a market is any arrangement that enables buyers and sellers to get information and to do business with each other.

A market has two sides: buyers and sellers. There are markets for goods such as apples and hiking boots, for services such as haircuts and tennis lessons, for factors of production such as computer programmers and earthmovers, and for other manufactured inputs such as memory chips and auto parts. There are also markets for money such as Japanese yen and for financial securities such as Yahoo! stock. Only our imagination limits what can be traded in markets.

Some markets are physical places where buyers and sellers meet and where an auctioneer or a broker helps to determine the prices. Examples of this type of market are the New York Stock Exchange and the wholesale fish, meat, and produce markets.

Some markets are groups of people spread around the world who never meet and know little about each other but are connected through the Internet or by telephone and fax. Examples are the e-commerce markets and the currency markets.

But most markets are unorganized collections of buyers and sellers. You do most of your trading in this type of market. An example is the market for basketball shoes. The buyers in this $3 billion-a-year market are the 45 million Americans who play basketball (or who want to make a fashion statement). The sellers are the tens of thousands of retail sports equipment and footwear stores. Each buyer can visit several different stores, and each seller knows that the buyer has a choice of stores.

Markets vary in the intensity of competition that buyers and sellers face. In this chapter, we’re going to study a competitive market—a market that has many buyers and many sellers, so no single buyer or seller can influence the price.

Producers offer items for sale only if the price is high enough to cover their opportunity cost. And consumers respond to changing opportunity cost by seeking cheaper alternatives to expensive items.

We are going to study how people respond to prices and the forces that determine prices. But to pursue these tasks, we need to understand the relationship between a price and an opportunity cost.

In everyday life, the price of an object is the number of dollars that must be given up in exchange for it. Economists refer to this price as the money price.

The opportunity cost of an action is the highest-valued alternative forgone. If, when you buy a cup of coffee, the highest-valued thing you forgo is some gum, then the opportunity cost of the coffee is the quantity of gum forgone. We can calculate the quantity of gum forgone from the money prices of the coffee and the gum.

If the money price of coffee is $1 a cup and the money price of gum is 50¢ a pack, then the opportunity cost of one cup of coffee is two packs of gum. To calculate this opportunity cost, we divide the price of a cup of coffee by the price of a pack of gum and find the ratio of one price to the other. The ratio of one price to another is called a relative price, and a relative price is an opportunity cost.

We can express the relative price of coffee in terms of gum or any other good. The normal way of expressing a relative price is in terms of a “basket” of all goods and services. To calculate this relative price, we divide the money price of a good by the money price of a “basket” of all goods (called a price index). The resulting relative price tells us the opportunity cost of the good in terms of how much of the “basket” we must give up to buy it.

The demand and supply model that we are about to study determines relative prices, and the word “price” means relative price. When we predict that a price will fall, we do not mean that its money price will fall—although it might. We mean that its relative price will fall. That is, its price will fall relative to the average price of other goods and services.

REVIEW QUIZ

1 What is the distinction between a money price and a relative price?
2 Explain why a relative price is an opportunity cost.
3 Think of examples of goods whose relative price has risen or fallen by a large amount.

You can work these questions in Study Plan 3.1 and get instant feedback. MyEconLab

Let's begin our study of demand and supply, starting with demand.
Demand

If you demand something, then you
1. Want it.
2. Can afford it.
3. Plan to buy it.

Wants are the unlimited desires or wishes that people have for goods and services. How many times have you thought that you would like something “if only you could afford it” or “if it weren’t so expensive”? Scarcity guarantees that many—perhaps most—of our wants will never be satisfied. Demand reflects a decision about which wants to satisfy.

The quantity demanded of a good or service is the amount that consumers plan to buy during a given time period at a particular price. The quantity demanded is not necessarily the same as the quantity actually bought. Sometimes the quantity demanded exceeds the amount of goods available, so the quantity bought is less than the quantity demanded.

The quantity demanded is measured as an amount per unit of time. For example, suppose that you buy one cup of coffee a day. The quantity of coffee that you demand can be expressed as 1 cup per day, 7 cups per week, or 365 cups per year.

Many factors influence buying plans, and one of them is the price. We look first at the relationship between the quantity demanded of a good and its price. To study this relationship, we keep all other influences on buying plans the same and we ask: How, other things remaining the same, does the quantity demanded of a good change as its price changes?

The law of demand provides the answer.

**The Law of Demand**
The law of demand states:

Other things remaining the same, the higher the price of a good, the smaller is the quantity demanded; and the lower the price of a good, the greater is the quantity demanded.

Why does a higher price reduce the quantity demanded? For two reasons:

- Substitution effect
- Income effect

**Substitution Effect** When the price of a good rises, other things remaining the same, its relative price—its opportunity cost—rises. Although each good is unique, it has substitutes—other goods that can be used in its place. As the opportunity cost of a good rises, the incentive to economize on its use and switch to a substitute becomes stronger.

**Income Effect** When a price rises, other things remaining the same, the price rises relative to income. Faced with a higher price and an unchanged income, people cannot afford to buy all the things they previously bought. They must decrease the quantities demanded of at least some goods and services. Normally, the good whose price has increased will be one of the goods that people buy less of.

To see the substitution effect and the income effect at work, think about the effects of a change in the price of an energy bar. Several different goods are substitutes for an energy bar. For example, an energy drink could be consumed instead of an energy bar.

Suppose that an energy bar initially sells for $3 and then its price falls to $1.50. People now substitute energy bars for energy drinks—the substitution effect. And with a budget that now has some slack from the lower price of an energy bar, people buy even more energy bars—the income effect. The quantity of energy bars demanded increases for these two reasons.

Now suppose that an energy bar initially sells for $3 and then the price doubles to $6. People now buy fewer energy bars and more energy drinks—the substitution effect. And faced with a tighter budget, people buy even fewer energy bars—the income effect. The quantity of energy bars demanded decreases for these two reasons.

**Demand Curve and Demand Schedule**
You are now about to study one of the two most used curves in economics: the demand curve. You are also going to encounter one of the most critical distinctions: the distinction between demand and quantity demanded.

The term demand refers to the entire relationship between the price of a good and the quantity demanded of that good. Demand is illustrated by the demand curve and the demand schedule. The term quantity demanded refers to a point on a demand curve—the quantity demanded at a particular price.
Figure 3.1 shows the demand curve for energy bars. A **demand curve** shows the relationship between the quantity demanded of a good and its price when all other influences on consumers’ planned purchases remain the same.

The table in Fig. 3.1 is the demand schedule for energy bars. A **demand schedule** lists the quantities demanded at each price when all the other influences on consumers’ planned purchases remain the same. For example, if the price of a bar is 50¢, the quantity demanded is 22 million a week. If the price is $2.50, the quantity demanded is 5 million a week. The other rows of the table show the quantities demanded at prices of $1.00, $1.50, and $2.00.

We graph the demand schedule as a demand curve with the quantity demanded on the x-axis and the price on the y-axis. The points on the demand curve labeled A through E correspond to the rows of the demand schedule. For example, point A on the graph shows a quantity demanded of 22 million energy bars a week at a price of 50¢ a bar.

**Willingness and Ability to Pay** Another way of looking at the demand curve is as a willingness-and-ability-to-pay curve. The willingness and ability to pay is a measure of *marginal benefit*.

If a small quantity is available, the highest price that someone is willing and able to pay for one more unit is high. But as the quantity available increases, the marginal benefit of each additional unit falls and the highest price that someone is willing and able to pay also falls along the demand curve.

In Fig. 3.1, if only 5 million energy bars are available each week, the highest price that someone is willing to pay for the 5 millionth bar is $2.50. But if 22 million energy bars are available each week, someone is willing to pay 50¢ for the last bar bought.

**A Change in Demand**

When any factor that influences buying plans changes, other than the price of the good, there is a **change in demand**. Figure 3.2 illustrates an increase in demand. When demand increases, the demand curve shifts rightward and the quantity demanded at each price is greater. For example, at $2.50 a bar, the quantity demanded on the original (blue) demand curve is 5 million energy bars a week. On the new (red) demand curve, at $2.50 a bar, the quantity demanded is 15 million bars a week. Look closely at the numbers in the table and check that the quantity demanded at each price is greater.

<table>
<thead>
<tr>
<th>Price (dollars per bar)</th>
<th>Quantity demanded (millions of bars per week)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A 0.50</td>
<td>22</td>
</tr>
<tr>
<td>B 1.00</td>
<td>15</td>
</tr>
<tr>
<td>C 1.50</td>
<td>10</td>
</tr>
<tr>
<td>D 2.00</td>
<td>7</td>
</tr>
<tr>
<td>E 2.50</td>
<td>5</td>
</tr>
</tbody>
</table>

The table shows a demand schedule for energy bars. At a price of 50¢ a bar, 22 million bars a week are demanded; at a price of $1.50 a bar, 10 million bars a week are demanded. The demand curve shows the relationship between quantity demanded and price, other things remaining the same. The demand curve slopes downward: As the price falls, the quantity demanded increases.

The demand curve can be read in two ways. For a given price, the demand curve tells us the quantity that people plan to buy. For example, at a price of $1.50 a bar, people plan to buy 10 million bars a week. For a given quantity, the demand curve tells us the maximum price that consumers are willing and able to pay for the last bar available. For example, the maximum price that consumers will pay for the 15 millionth bar is $1.00.
Six main factors bring changes in demand. They are changes in

- The prices of related goods
- Expected future prices
- Income
- Expected future income and credit
- Population
- Preferences

**Prices of Related Goods** The quantity of energy bars that consumers plan to buy depends in part on the prices of substitutes for energy bars. A *substitute* is a good that can be used in place of another good. For example, a bus ride is a substitute for a train ride; a hamburger is a substitute for a hot dog; and an energy drink is a substitute for an energy bar. If the price of a substitute for an energy bar rises, people buy less of the substitute and more energy bars. For example, if the price of an energy drink rises, people buy fewer energy drinks and more energy bars. The demand for energy bars increases.

The quantity of energy bars that people plan to buy also depends on the prices of complements with energy bars. A *complement* is a good that is used in conjunction with another good. Hamburgers and fries are complements, and so are energy bars and exercise. If the price of an hour at the gym falls, people buy more gym time and *more* energy bars.

**Expected Future Prices** If the expected future price of a good rises and if the good can be stored, the opportunity cost of obtaining the good for future use is lower today than it will be in the future when people expect the price to be higher. So people retime their purchases—they substitute over time. They buy more of the good now before its price is expected to rise (and less afterward), so the demand for the good today increases.

For example, suppose that a Florida frost damages the season’s orange crop. You expect the price of orange juice to rise, so you fill your freezer with enough frozen juice to get you through the next six months. Your current demand for frozen orange juice has increased, and your future demand has decreased. Similarly, if the expected future price of a good falls, the opportunity cost of buying the good today is high relative to what it is expected to be in the future. So again, people retime their purchases. They buy less of the good now before its price is expected.

---

**FIGURE 3.2 An Increase in Demand**

A change in any influence on buying plans other than the price of the good itself results in a new demand schedule and a shift of the demand curve. A change in income changes the demand for energy bars. At a price of $1.50 a bar, 10 million bars a week are demanded at the original income (row C of the table) and 20 million bars a week are demanded at the new higher income (row C'). A rise in income increases the demand for energy bars. The demand curve shifts rightward, as shown by the shift arrow and the resulting red curve.
to fall, so the demand for the good decreases today and increases in the future.

Computer prices are constantly falling, and this fact poses a dilemma. Will you buy a new computer now, in time for the start of the school year, or will you wait until the price has fallen some more? Because people expect computer prices to keep falling, the current demand for computers is less (and the future demand is greater) than it otherwise would be.

**Income** Consumers’ income influences demand. When income increases, consumers buy more of most goods; and when income decreases, consumers buy less of most goods. Although an increase in income leads to an increase in the demand for most goods, it does not lead to an increase in the demand for all goods. A **normal good** is one for which demand increases as income increases. An **inferior good** is one for which demand decreases as income increases. As incomes increase, the demand for air travel (a normal good) increases and the demand for long-distance bus trips (an inferior good) decreases.

**Expected Future Income and Credit** When expected future income increases or credit becomes easier to get, demand for a good might increase now. For example, a salesperson gets the news that she will receive a big bonus at the end of the year, so she goes into debt and buys a new car right now, rather than waiting until she receives the bonus.

**Population** Demand also depends on the size and the age structure of the population. The larger the population, the greater is the demand for all goods and services; the smaller the population, the smaller is the demand for all goods and services.

For example, the demand for parking spaces or movies or just about anything that you can imagine is much greater in New York City (population 7.5 million) than it is in Boise, Idaho (population 150,000).

Also, the larger the proportion of the population in a given age group, the greater is the demand for the goods and services used by that age group.

For example, during the 1990s, a decrease in the college-age population decreased the demand for college places. During those same years, the number of Americans aged 85 years and over increased by more than 1 million. As a result, the demand for nursing home services increased.

---

**TABLE 3.1 The Demand for Energy Bars**

<table>
<thead>
<tr>
<th><strong>The Law of Demand</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>The quantity of energy bars demanded</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Decreases if:</strong></td>
<td><strong>Increases if:</strong></td>
</tr>
<tr>
<td>The price of an energy bar rises</td>
<td>The price of an energy bar falls</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Changes in Demand</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>The demand for energy bars</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Decreases if:</strong></td>
<td><strong>Increases if:</strong></td>
</tr>
<tr>
<td>The price of a substitute falls</td>
<td>The price of a substitute rises</td>
</tr>
<tr>
<td>The price of a complement rises</td>
<td>The price of a complement falls</td>
</tr>
<tr>
<td>The expected future price of an energy bar falls</td>
<td>The expected future price of an energy bar rises</td>
</tr>
<tr>
<td>Income falls*</td>
<td>Income rises*</td>
</tr>
<tr>
<td>Expected future income falls or credit becomes harder to get*</td>
<td>Expected future income rises or credit becomes easier to get*</td>
</tr>
<tr>
<td>The population decreases</td>
<td>The population increases</td>
</tr>
</tbody>
</table>

*An energy bar is a normal good.

**Preferences** Demand depends on preferences. Preferences determine the value that people place on each good and service. Preferences depend on such things as the weather, information, and fashion. For example, greater health and fitness awareness has shifted preferences in favor of energy bars, so the demand for energy bars has increased.

Table 3.1 summarizes the influences on demand and the direction of those influences.

**A Change in the Quantity Demanded Versus a Change in Demand**

Changes in the influences on buying plans bring either a change in the quantity demanded or a change in demand. Equivalently, they bring either a movement along the demand curve or a shift of the demand curve. The distinction between a change in
the quantity demanded and a change in demand is the same as that between a movement along the demand curve and a shift of the demand curve.

A point on the demand curve shows the quantity demanded at a given price, so a movement along the demand curve shows a change in the quantity demanded. The entire demand curve shows demand, so a shift of the demand curve shows a change in demand. Figure 3.3 illustrates these distinctions.

**Movement Along the Demand Curve** If the price of the good changes but no other influence on buying plans changes, we illustrate the effect as a movement along the demand curve.

A fall in the price of a good increases the quantity demanded of it. In Fig. 3.3, we illustrate the effect of a fall in price as a movement down along the demand curve $D_0$.

A rise in the price of a good decreases the quantity demanded of it. In Fig. 3.3, we illustrate the effect of a rise in price as a movement up along the demand curve $D_0$.

**A Shift of the Demand Curve** If the price of a good remains constant but some other influence on buying plans changes, there is a change in demand for that good. We illustrate a change in demand as a shift of the demand curve. For example, if more people work out at the gym, consumers buy more energy bars regardless of the price of a bar. That is what a rightward shift of the demand curve shows—more energy bars are demanded at each price.

In Fig. 3.3, there is a change in demand and the demand curve shifts when any influence on buying plans changes, other than the price of the good. Demand increases and the demand curve shifts rightward (to the red demand curve $D_1$) if the price of a substitute rises, the price of a complement falls, the expected future price of the good rises, income increases (for a normal good), expected future income or credit increases, or the population increases. Demand decreases and the demand curve shifts leftward (to the red demand curve $D_2$) if the price of a substitute falls, the price of a complement rises, the expected future price of the good falls, income decreases (for a normal good), expected future income or credit decreases, or the population decreases. (For an inferior good, the effects of changes in income are in the opposite direction to those described above.)

**FIGURE 3.3** A Change in the Quantity Demanded Versus a Change in Demand

When the price of the good changes, there is a movement along the demand curve and a change in the quantity demanded, shown by the blue arrows on demand curve $D_0$. When any other influence on buying plans changes, there is a shift of the demand curve and a change in demand. An increase in demand shifts the demand curve rightward (from $D_0$ to $D_1$). A decrease in demand shifts the demand curve leftward (from $D_0$ to $D_2$).

MyEconLab animation

**REVIEW QUIZ**

1. Define the quantity demanded of a good or service.
2. What is the law of demand and how do we illustrate it?
3. What does the demand curve tell us about the price that consumers are willing to pay?
4. List all the influences on buying plans that change demand, and for each influence, say whether it increases or decreases demand.
5. Why does demand not change when the price of a good changes with no change in the other influences on buying plans?

You can work these questions in Study Plan 3.2 and get instant feedback. MyEconLab
Why does a higher price increase the quantity supplied? It is because marginal cost increases. As the quantity produced of any good increases, the marginal cost of producing the good increases. (See Chapter 2, p. 35 to review marginal cost.)

It is never worth producing a good if the price received for the good does not at least cover the marginal cost of producing it. When the price of a good rises, other things remaining the same, producers are willing to incur a higher marginal cost, so they increase production. The higher price brings forth an increase in the quantity supplied.

Let’s now illustrate the law of supply with a supply curve and a supply schedule.

### Supply Curve and Supply Schedule

You are now going to study the second of the two most used curves in economics: the supply curve. You’re also going to learn about the critical distinction between supply and quantity supplied.

The term supply refers to the entire relationship between the price of a good and the quantity supplied of it. Supply is illustrated by the supply curve and the supply schedule. The term quantity supplied refers to a point on a supply curve—the quantity supplied at a particular price.

Figure 3.4 shows the supply curve of energy bars. A supply curve shows the relationship between the quantity supplied of a good and its price when all other influences on producers’ planned sales remain the same. The supply curve is a graph of a supply schedule.

The table in Fig. 3.4 sets out the supply schedule for energy bars. A supply schedule lists the quantities supplied at each price when all the other influences on producers’ planned sales remain the same. For example, if the price of an energy bar is 50¢, the quantity supplied is zero—in row A of the table. If the price of an energy bar is $1.00, the quantity supplied is 6 million energy bars a week—in row B. The other rows of the table show the quantities supplied at prices of $1.50, $2.00, and $2.50.

To make a supply curve, we graph the quantity supplied on the x-axis and the price on the y-axis. The points on the supply curve labeled A through E correspond to the rows of the supply schedule. For example, point A on the graph shows a quantity supplied of zero at a price of 50¢ an energy bar. Point E shows a quantity supplied of 15 million bars at $2.50 an energy bar.
Minimum Supply Price. The supply curve can be interpreted as a minimum-supply-price curve—a curve that shows the lowest price at which someone is willing to sell. This lowest price is the marginal cost. If a small quantity is produced, the lowest price at which someone is willing to sell one more unit is low. But as the quantity produced increases, the marginal cost of each additional unit rises, so the lowest price at which someone is willing to sell an additional unit rises along the supply curve.

In Fig. 3.4, if 15 million bars are produced each week, the lowest price at which someone is willing to sell the 15 millionth bar is $2.50. But if 10 million bars are produced each week, someone is willing to accept $1.50 for the last bar produced.

A Change in Supply

When any factor that influences selling plans other than the price of the good changes, there is a change in supply. Six main factors bring changes in supply. They are changes in

- The prices of factors of production
- The prices of related goods produced
- Expected future prices
- The number of suppliers
- Technology
- The state of nature

Prices of Factors of Production. The prices of the factors of production used to produce a good influence its supply. To see this influence, think about the supply curve as a minimum-supply-price curve. If the price of a factor of production rises, the lowest price that a producer is willing to accept for that good rises, so supply decreases. For example, during 2008, as the price of jet fuel increased, the supply of air travel decreased. Similarly, a rise in the minimum wage decreases the supply of hamburgers.

Prices of Related Goods Produced. The prices of related goods that firms produce influence supply. For example, if the price of energy gel rises, firms switch production from bars to gel. The supply of energy bars decreases. Energy bars and energy gel are substitutes in production—goods that can be produced by using the same resources. If the price of beef rises, the supply of cowhide increases. Beef and cowhide are complements in production—goods that must be produced together.

<table>
<thead>
<tr>
<th>Price (dollars per bar)</th>
<th>Quantity supplied (millions of bars per week)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A 0.50</td>
<td>0</td>
</tr>
<tr>
<td>B 1.00</td>
<td>6</td>
</tr>
<tr>
<td>C 1.50</td>
<td>10</td>
</tr>
<tr>
<td>D 2.00</td>
<td>13</td>
</tr>
<tr>
<td>E 2.50</td>
<td>15</td>
</tr>
</tbody>
</table>
**Expected Future Prices** If the expected future price of a good rises, the return from selling the good in the future increases and is higher than it is today. So supply decreases today and increases in the future.

**The Number of Suppliers** The larger the number of firms that produce a good, the greater is the supply of the good. As new firms enter an industry, the supply in that industry increases. As firms leave an industry, the supply in that industry decreases.

**Technology** The term “technology” is used broadly to mean the way that factors of production are used to produce a good. A technology change occurs when a new method is discovered that lowers the cost of producing a good. For example, new methods used in the factories that produce computer chips have lowered the cost and increased the supply of chips.

**The State of Nature** The state of nature includes all the natural forces that influence production. It includes the state of the weather and, more broadly, the natural environment. Good weather can increase the supply of many agricultural products and bad weather can decrease their supply. Extreme natural events such as earthquakes, tornadoes, and hurricanes can also influence supply.

Figure 3.5 illustrates an increase in supply. When supply increases, the supply curve shifts rightward and the quantity supplied at each price is larger. For example, at $1.50 per bar, on the original (blue) supply curve, the quantity supplied is 10 million bars a week. On the new (red) supply curve, the quantity supplied is 20 million bars a week. Look closely at the numbers in the table in Fig. 3.5 and check that the quantity supplied is larger at each price.

Table 3.2 summarizes the influences on supply and the directions of those influences.

### A Change in the Quantity Supplied Versus a Change in Supply

Changes in the influences on selling plans bring either a change in the quantity supplied or a change in supply. Equivalently, they bring either a movement along the supply curve or a shift of the supply curve.

A point on the supply curve shows the quantity supplied at a given price. A movement along the supply curve shows a **change in the quantity supplied**. The entire supply curve shows supply. A shift of the supply curve shows a **change in supply**.

### Figure 3.5 An Increase in Supply

![Image of supply curve]

**Table 3.2**

<table>
<thead>
<tr>
<th>Old technology</th>
<th>New technology</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Price (dollars per bar)</strong></td>
<td><strong>Quantity supplied (millions of bars per week)</strong></td>
</tr>
<tr>
<td>A</td>
<td>0.50</td>
</tr>
<tr>
<td>B</td>
<td>1.00</td>
</tr>
<tr>
<td>C</td>
<td>1.50</td>
</tr>
<tr>
<td>D</td>
<td>2.00</td>
</tr>
<tr>
<td>E</td>
<td>2.50</td>
</tr>
</tbody>
</table>

A change in any influence on selling plans other than the price of the good itself results in a new supply schedule and a shift of the supply curve. For example, a new, cost-saving technology for producing energy bars changes the supply of energy bars. At a price of $1.50 a bar, 10 million bars a week are supplied when producers use the old technology (row C of the table) and 20 million energy bars a week are supplied when producers use the new technology (row C’).

An advance in technology increases the supply of energy bars. The supply curve shifts rightward, as shown by the shift arrow and the resulting red curve.
Figure 3.6 illustrates and summarizes these distinctions. If the price of the good changes and other things remain the same, there is a *change in the quantity supplied* of that good. If the price of the good falls, the quantity supplied decreases and there is a movement down along the supply curve $S_0$. If the price of the good rises, the quantity supplied increases and there is a movement up along the supply curve $S_0$. When any other influence on selling plans changes, the supply curve shifts and there is a *change in supply*. If supply increases, the supply curve shifts rightward to $S_1$. If supply decreases, the supply curve shifts leftward to $S_2$.

**TABLE 3.2 The Supply of Energy Bars**

**The Law of Supply**

<table>
<thead>
<tr>
<th>Decreases if:</th>
<th>Increases if:</th>
</tr>
</thead>
<tbody>
<tr>
<td>The price of an energy bar falls</td>
<td>The price of an energy bar rises</td>
</tr>
</tbody>
</table>

**Changes in Supply**

<table>
<thead>
<tr>
<th>Decreases if:</th>
<th>Increases if:</th>
</tr>
</thead>
<tbody>
<tr>
<td>The price of a factor of production used to produce energy bars rises</td>
<td>The price of a factor of production used to produce energy bars falls</td>
</tr>
<tr>
<td>The price of a substitute in production rises</td>
<td>The price of a substitute in production falls</td>
</tr>
<tr>
<td>The price of a complement in production falls</td>
<td>The price of a complement in production rises</td>
</tr>
<tr>
<td>The expected future price of an energy bar rises</td>
<td>The expected future price of an energy bar falls</td>
</tr>
<tr>
<td>The number of suppliers of bars decreases</td>
<td>The number of suppliers of bars increases</td>
</tr>
<tr>
<td>A technology change decreases energy bar production</td>
<td>A technology change increases energy bar production</td>
</tr>
<tr>
<td>A natural event decreases energy bar production</td>
<td>A natural event increases energy bar production</td>
</tr>
</tbody>
</table>

When the price of the good changes, there is a movement along the supply curve and a *change in the quantity supplied*, shown by the blue arrows on supply curve $S_0$. When any other influence on selling plans changes, there is a shift of the supply curve and a *change in supply*. An increase in supply shifts the supply curve rightward (from $S_0$ to $S_1$), and a decrease in supply shifts the supply curve leftward (from $S_0$ to $S_2$).

**REVIEW QUIZ**

1. Define the quantity supplied of a good or service.
2. What is the law of supply and how do we illustrate it?
3. What does the supply curve tell us about the producer’s minimum supply price?
4. List all the influences on selling plans, and for each influence, say whether it changes supply.
5. What happens to the quantity of cell phones supplied and the supply of cell phones if the price of a cell phone falls?

You can work these questions in Study Plan 3.3 and get instant feedback.

Now we’re going to combine demand and supply and see how prices and quantities are determined.
Market Equilibrium

We have seen that when the price of a good rises, the quantity demanded decreases and the quantity supplied increases. We are now going to see how the price adjusts to coordinate buying plans and selling plans and achieve an equilibrium in the market.

An equilibrium is a situation in which opposing forces balance each other. Equilibrium in a market occurs when the price balances buying plans and selling plans. The equilibrium price is the price at which the quantity demanded equals the quantity supplied. The equilibrium quantity is the quantity bought and sold at the equilibrium price. A market moves toward its equilibrium because

- Price regulates buying and selling plans.
- Price adjusts when plans don’t match.

Price as a Regulator

The price of a good regulates the quantities demanded and supplied. If the price is too high, the quantity supplied exceeds the quantity demanded. If the price is too low, the quantity demanded exceeds the quantity supplied. There is one price at which the quantity demanded equals the quantity supplied.

Let’s work out what that price is.

Figure 3.7 shows the market for energy bars. The table shows the demand schedule (from Fig. 3.1) and the supply schedule (from Fig. 3.4). If the price is 50¢ a bar, the quantity demanded is 22 million bars a week but no bars are supplied. There is a shortage of 22 million bars a week. The final column of the table shows this shortage. At a price of $1.00 a bar, there is still a shortage but only of 9 million bars a week.

If the price is $2.50 a bar, the quantity supplied is 15 million bars a week but the quantity demanded is only 5 million. There is a surplus of 10 million bars a week.

The one price at which there is neither a shortage nor a surplus is $1.50 a bar. At that price, the quantity demanded equals the quantity supplied: 10 million bars a week. The equilibrium price is $1.50 a bar, and the equilibrium quantity is 10 million bars a week.

Figure 3.7 shows that the demand curve and the supply curve intersect at the equilibrium price of $1.50 a bar. At each price above $1.50 a bar, there is a surplus of bars. For example, at $2.00 a bar, the surplus is 6 million bars.

The table lists the quantity demanded and the quantity supplied as well as the shortage or surplus of bars at each price. If the price is $1.00 a bar, 15 million bars a week are demanded and 6 million bars are supplied. There is a shortage of 9 million bars a week, and the price rises.

If the price is $2.00 a bar, 7 million bars a week are demanded and 13 million bars are supplied. There is a surplus of 6 million bars a week, and the price falls.

If the price is $1.50 a bar, 10 million bars a week are demanded and 10 million bars are supplied. There is neither a shortage nor a surplus, and the price does not change. The price at which the quantity demanded equals the quantity supplied is the equilibrium price, and 10 million bars a week is the equilibrium quantity.
million bars a week, as shown by the blue arrow. At each price below $1.50 a bar, there is a shortage of bars. For example, at $1.00 a bar, the shortage is 9 million bars a week, as shown by the red arrow.

**Price Adjustments**

You’ve seen that if the price is below equilibrium, there is a shortage and that if the price is above equilibrium, there is a surplus. But can we count on the price to change and eliminate a shortage or a surplus? We can, because such price changes are beneficial to both buyers and sellers. Let’s see why the price changes when there is a shortage or a surplus.

**A Shortage Forces the Price Up** Suppose the price of an energy bar is $1. Consumers plan to buy 15 million bars a week, and producers plan to sell 6 million bars a week. Consumers can’t force producers to sell more than they plan, so the quantity that is actually offered for sale is 6 million bars a week. In this situation, powerful forces operate to increase the price and move it toward the equilibrium price. Some producers, noticing lines of unsatisfied consumers, raise the price. Some producers increase their output. As producers push the price up, the price rises toward its equilibrium. The rising price reduces the shortage because it decreases the quantity demanded and increases the quantity supplied. When the price has increased to the point at which there is no longer a shortage, the forces moving the price stop operating and the price comes to rest at its equilibrium.

**A Surplus Forces the Price Down** Suppose the price of a bar is $2. Producers plan to sell 13 million bars a week, and consumers plan to buy 7 million bars a week. Producers cannot force consumers to buy more than they plan, so the quantity that is actually bought is 7 million bars a week. In this situation, powerful forces operate to lower the price and move it toward the equilibrium price. Some producers, unable to sell the quantities of energy bars they planned to sell, cut their prices. In addition, some producers scale back production. As producers cut the price, the price falls toward its equilibrium. The falling price decreases the surplus because it increases the quantity demanded and decreases the quantity supplied. When the price has fallen to the point at which there is no longer a surplus, the forces moving the price stop operating and the price comes to rest at its equilibrium.

**The Best Deal Available for Buyers and Sellers**

When the price is below equilibrium, it is forced upward. Why don’t buyers resist the increase and refuse to buy at the higher price? The answer is because they value the good more highly than its current price and they can’t satisfy their demand at the current price. In some markets—for example, the markets that operate on eBay—the buyers might even be the ones who force the price up by offering to pay a higher price.

When the price is above equilibrium, it is bid downward. Why don’t sellers resist this decrease and refuse to sell at the lower price? The answer is because their minimum supply price is below the current price and they cannot sell all they would like to at the current price. Sellers willingly lower the price to gain market share.

At the price at which the quantity demanded and the quantity supplied are equal, neither buyers nor sellers can do business at a better price. Buyers pay the highest price they are willing to pay for the last unit bought, and sellers receive the lowest price at which they are willing to supply the last unit sold.

When people freely make offers to buy and sell and when demanders try to buy at the lowest possible price and suppliers try to sell at the highest possible price, the price at which trade takes place is the equilibrium price—the price at which the quantity demanded equals the quantity supplied. The price coordinates the plans of buyers and sellers, and no one has an incentive to change it.

---

**REVIEW QUIZ**

1. What is the equilibrium price of a good or service?
2. Over what range of prices does a shortage arise? What happens to the price when there is a shortage?
3. Over what range of prices does a surplus arise? What happens to the price when there is a surplus?
4. Why is the price at which the quantity demanded equals the quantity supplied the equilibrium price?
5. Why is the equilibrium price the best deal available for both buyers and sellers?

You can work these questions in Study Plan 3.4 and get instant feedback.
Predicting Changes in Price and Quantity

The demand and supply model that we have just studied provides us with a powerful way of analyzing influences on prices and the quantities bought and sold. According to the model, a change in price stems from a change in demand, a change in supply, or a change in both demand and supply. Let’s look first at the effects of a change in demand.

An Increase in Demand

If more people join health clubs, the demand for energy bars increases. The table in Fig. 3.8 shows the original and new demand schedules for energy bars as well as the supply schedule of energy bars.

The increase in demand creates a shortage at the original price and to eliminate the shortage, the price must rise.

Figure 3.8 shows what happens. The figure shows the original demand for and supply of energy bars. The original equilibrium price is $1.50 an energy bar, and the equilibrium quantity is 10 million energy bars a week. When demand increases, the demand curve shifts rightward. The equilibrium price rises to $2.50 an energy bar, and the quantity supplied increases to 15 million energy bars a week, as highlighted in the figure. There is an increase in the quantity supplied but no change in supply—a movement along, but no shift of, the supply curve.

A Decrease in Demand

We can reverse this change in demand. Start at a price of $2.50 a bar with 15 million energy bars a week being bought and sold, and then work out what happens if demand decreases to its original level. Such a decrease in demand might arise if people switch to energy gel (a substitute for energy bars). The decrease in demand shifts the demand curve leftward. The equilibrium price falls to $1.50 a bar, the quantity supplied decreases, and the equilibrium quantity decreases to 10 million bars a week.

We can now make our first two predictions:

1. When demand increases, the price rises and the quantity increases.
2. When demand decreases, the price falls and the quantity decreases.
The Market for College Education

Obama Decrees Rising Cost of College Education
President Obama told colleges, “You can’t assume that you’ll just jack up tuition every single year. . . . In the coming decade, 60 percent of new jobs will require more than a high school diploma . . . Higher education is not a luxury. It’s an economic imperative that every family in America should be able to afford.”


THE DATA
The scatter diagram provides data on college enrollments and tuition from 1981 through 2010.

THE QUESTIONS
- What does the scatter diagram tell us?
- Why has college tuition increased? Is it because demand increased or supply increased?

THE ANSWERS
- The scatter diagram tells us that both tuition and enrollments have increased every year.
- An increase in demand brings a rise in the price (tuition) and an increase in the quantity (enrollments).
- An increase in supply brings a fall in the price and an increase in the quantity.
- Because both the price (tuition) and quantity (enrollments) have increased, the demand for college education has increased.
- The figure shows the market for college education.
- The supply curve of college education, S, slopes upward because the principle of increasing opportunity cost applies to college education just as it does to other goods and services.

In 2001, the demand for college education was \( D_{2001} \). The equilibrium tuition was $15,000 and 16 million students were enrolled in college.

Between 2001 and 2010:
1) Income per person increased
2) Population increased, and
3) More new jobs required higher education.

These (and possibly other) factors increased the demand for a college education. The demand curve shifted rightward to \( D_{2010} \). Equilibrium tuition increased to $21,000 and the quantity supplied increased to 21 million students.
An Increase in Supply

When Nestlé (the producer of PowerBar) and other energy bar producers switch to a new cost-saving technology, the supply of energy bars increases. Figure 3.9 shows the new supply schedule (the same one that was shown in Fig. 3.5). What are the new equilibrium price and quantity? The price falls to $1.00 a bar, and the quantity increases to 15 million bars a week. You can see why by looking at the quantities demanded and supplied at the old price of $1.50 a bar. The new quantity supplied at that price is 20 million bars a week, and there is a surplus. The price falls. Only when the price is $1.00 a bar does the quantity supplied equal the quantity demanded.

Figure 3.9 illustrates the effect of an increase in supply. It shows the demand curve for energy bars and the original and new supply curves. The initial equilibrium price is $1.50 a bar, and the equilibrium quantity is 10 million bars a week. When supply increases, the supply curve shifts rightward. The equilibrium price falls to $1.00 a bar, and the quantity demanded increases to 15 million bars a week, highlighted in the figure. There is an increase in the quantity demanded but no change in demand—a movement along, but no shift of, the demand curve.

A Decrease in Supply

Start out at a price of $1.00 a bar with 15 million bars a week being bought and sold. Then suppose that the cost of labor or raw materials rises and the supply of energy bars decreases. The decrease in supply shifts the supply curve leftward. The equilibrium price rises to $1.50 a bar, the quantity demanded decreases, and the equilibrium quantity decreases to 10 million bars a week.

We can now make two more predictions:

1. When supply increases, the price falls and the quantity increases.
2. When supply decreases, the price rises and the quantity decreases.

You’ve now seen what happens to the price and the quantity when either demand or supply changes while the other one remains unchanged. In real markets, both demand and supply can change together. When this happens, to predict the changes in price and quantity, we must combine the effects that you’ve just seen. That is your final task in this chapter.
**The Market for Gasoline**

**Gas Prices: Down and Headed Lower**
The price of gasoline has been falling for more than a month. With oil prices also falling, more falls at the pump are expected.

Source: CNN Money, May 4, 2012

**THE DATA**

<table>
<thead>
<tr>
<th>Quantity (millions of gallons per week)</th>
<th>Price (dollars per gallon)</th>
</tr>
</thead>
<tbody>
<tr>
<td>April 6, 2012</td>
<td>365</td>
</tr>
<tr>
<td>April 4, 2012</td>
<td>372</td>
</tr>
</tbody>
</table>

**THE QUESTIONS**

- What does the data table tell us?
- Why did the price of gasoline decrease? Is it because demand changed or because supply changed, and in which direction?

**THE ANSWERS**

- The data table tells us that between April and May 2012, the quantity of gasoline used increased and the price of gasoline fell.
- An increase in demand brings an increase in the quantity and a rise in the price.
- An increase in supply brings an increase in the quantity and a fall in the price.
- Because the quantity of gasoline used increased and the price of gasoline fell, there must have been an increase in the supply of gasoline.
- The supply of gasoline increases if the price of a factor of production used to produce gasoline falls. The news clip says the price of oil, which is used to produce gasoline, is falling. So the fall in the price of oil is the source of the increase in the supply.
- The figure illustrates the market for gasoline in 2012.
- The demand curve $D_{April}$ shows the demand. In early April, the supply curve was $S_0$, the price was $4.00 per gallon, and the quantity used was 365 million gallons per day.
- By the end of April and early May, the lower price of oil had increased the supply of gasoline to $S_1$. The price fell to $3.85 per gallon and the quantity used increased to 372 million gallons per day.

**The Market for Gasoline in April 2012**

- The lower price brought an increase in the quantity of gasoline demanded, which is shown by the movement along the demand curve.
All the Possible Changes in Demand and Supply

Figure 3.10 brings together and summarizes the effects of all the possible changes in demand and supply. With what you’ve learned about the effects of a change in either demand or supply, you can predict what happens if both demand and supply change together. Let’s begin by reviewing what you already know.

Change in Demand with No Change in Supply

The first row of Fig. 3.10, parts (a), (b), and (c), summarizes the effects of a change in demand with no change in supply. In part (a), with no change in either demand or supply, neither the price nor the quantity changes. With an increase in demand and no change in supply in part (b), both the price and quantity increase. And with a decrease in demand and no change in supply in part (c), both the price and the quantity decrease.

Change in Supply with No Change in Demand

The first column of Fig. 3.10, parts (a), (d), and (g), summarizes the effects of a change in supply with no change in demand. With an increase in supply and no change in demand in part (d), the price falls and quantity increases. And with a decrease in supply and no change in demand in part (g), the price rises and the quantity decreases.

Increase in Both Demand and Supply

You’ve seen that an increase in demand raises the price and increases the quantity. And you’ve seen that an increase in supply lowers the price and increases the quantity. Fig. 3.10(e) combines these two changes. Because either an increase in demand or an increase in supply increases the quantity, the quantity also increases when both demand and supply increase. But the effect on the price is uncertain. An increase in demand raises the price and an increase in supply lowers the price, so we can’t say whether the price will rise or fall when both demand and supply increase. We need to know the magnitudes of the changes in demand and supply to predict the effects on price. In the example in Fig. 3.10(e), the price does not change. But notice that if demand increases by slightly more than the amount shown in the figure, the price will rise. And if supply increases by slightly more than the amount shown in the figure, the price will fall.

Decrease in Both Demand and Supply

Figure 3.10(i) shows the case in which demand and supply both decrease. For the same reasons as those we’ve just reviewed, when both demand and supply decrease, the quantity decreases, and again the direction of the price change is uncertain.

Decrease in Demand and Increase in Supply

You’ve seen that a decrease in demand lowers the price and decreases the quantity. And you’ve seen that an increase in supply lowers the price and increases the quantity. Fig. 3.10(f) combines these two changes. Both the decrease in demand and the increase in supply lower the price, so the price falls. But a decrease in demand decreases the quantity and an increase in supply increases the quantity, so we can’t predict the direction in which the quantity will change unless we know the magnitudes of the changes in demand and supply. In the example in Fig. 3.10(f), the quantity does not change. But notice that if demand decreases by slightly more than the amount shown in the figure, the quantity will decrease; if supply increases by slightly more than the amount shown in the figure, the quantity will increase.

Increase in Demand and Decrease in Supply

Figure 3.10(h) shows the case in which demand increases and supply decreases. Now, the price rises, and again the direction of the quantity change is uncertain.

REVIEW QUIZ

What is the effect on the price and quantity of MP3 players (such as the iPod) if

1 The price of a PC falls or the price of an MP3 download rises? (Draw the diagrams!)
2 More firms produce MP3 players or electronics workers’ wages rise? (Draw the diagrams!)
3 Any two of the events in questions 1 and 2 occur together? (Draw the diagrams!)

You can work these questions in Study Plan 3.5 and get instant feedback. MyEconLab

To complete your study of demand and supply, take a look at Reading Between the Lines on pp. 74–75, which explains why the price of peanut butter increased in 2011. Try to get into the habit of using the demand and supply model to understand the movements in prices in your everyday life.
FIGURE 3.10 The Effects of All the Possible Changes in Demand and Supply

(a) No change in demand or supply

(b) Increase in demand

(c) Decrease in demand

(d) Increase in supply

(e) Increase in both demand and supply

(f) Decrease in demand; increase in supply

(g) Decrease in supply

(h) Increase in demand; decrease in supply

(i) Decrease in both demand and supply

MyEconLab animation
Demand and Supply:  
The Price of Peanut Butter

Peanut Butter Prices Expected to Rise After Dry Summer  
The Augusta Chronicle  
October 12, 2011

Another hot, dry summer in key producing states and competition from more profitable crops including cotton have significantly shrunk the U.S. peanut crop this year.

U.S. farmers are expected to produce roughly 1.8 million tons of peanuts this year, down nearly 13 percent from last year, according to a survey released Wednesday by the Department of Agriculture. Assuming that estimate holds, it would be the smallest harvest since 2006.

Peanut butter producers already have plans to raise prices for peanut butter significantly in the next few weeks. . . . The J.M. Smucker Co., which makes Jif peanut butter, plans to raise its wholesale prices 30 percent in November. Kraft Foods Co., which launched its Planters peanut butter in June, is raising prices 40 percent on Oct. 31.

A spokesperson for ConAgra Foods Inc., which makes Peter Pan peanut butter, was not immediately available to comment but multiple media outlets report that the company plans to raise its prices as well.

Unilever, which makes Skippy brand peanut butter, said the company is watching the commodities market very closely.

Georgia, the largest peanut-producing state in the country, saw record-breaking heat and a lack of rainfall that prevented some peanut seeds from even germinating in the field. Plants that did grow were baked in the hot summer sun, producing poor-quality nuts.

According to USDA estimates this week, farmers who had runner peanuts—the most common kind and the type used for peanut butter—could sell their crop for nearly $1,200 a ton, up from nearly $450 a ton last year.

ESSENCE OF THE STORY

- A hot and dry 2011 summer resulted in a poor peanut harvest.
- Because cotton was more profitable, some farmers switched from peanuts to cotton.
- U.S. peanut production in 2011 was 1.8 million tons, down nearly 13 percent from 2010.
- The price of peanuts increased from $450 per ton in 2010 to $1,200 per ton in 2011.
- Peanut butter producers raised their prices by up to 40 percent.
This news article reports events in two markets: the market for peanuts and the market for peanut butter. In the market for peanuts, a hot, dry summer decreased supply. Also, a rise in the price of cotton, a substitute in production for peanuts, led farmers to plant more cotton acres and fewer peanuts acres, so the supply of peanuts decreased for a second reason. The decrease in supply led to a large increase in price, a decrease in the quantity demanded, and a decrease in the equilibrium quantity of peanuts. Figure 1 illustrates the market for peanuts in 2010 and 2011. The demand curve for peanuts is \( D \). In 2010, the supply curve was \( S_0 \). The equilibrium price was $450 per ton and 2 million tons of peanuts were produced. In 2011, supply decreased and the supply curve shifted leftward to \( S_1 \). The equilibrium price increased to $1,200 per ton and the equilibrium quantity decreased to 1.8 million tons. The quantity demanded decreased, shown by the movement along the demand curve \( D \). Peanuts along with labor and capital are used to make peanut butter. So the rise in the price of peanuts increased the cost of producing peanut butter and decreased its supply. The decrease in the supply of peanut butter led to an increase in price, a decrease in the quantity demanded, and a decrease in the equilibrium quantity of peanut butter. Figure 2 illustrates the market for peanut butter in 2010 and 2011. The demand curve for peanut butter is \( D \). In 2010, the supply curve was \( S_0 \). The equilibrium price was $2.00 per pound and 350 million pounds of peanut butter were produced. In 2011, supply decreased and the supply curve shifted leftward to \( S_1 \). The equilibrium price increased to $2.80 per pound and the equilibrium quantity decreased to 300 million pounds. The quantity of peanut butter demanded decreased, shown by the movement along the demand curve \( D \). Notice that the increase in the price of peanut butter, a 40 percent increase, was much smaller than the increase in the price of peanuts, an increase from $450 to $1,200 or a 167 percent increase. Can you explain why?
CHAPTER 3 Demand and Supply

Supply Curve

The law of supply says that as the price of a good or service rises, the quantity supplied of that good or service increases. We can illustrate the law of supply by drawing a graph of the supply curve or writing down an equation. When the supply curve is a straight line, the following equation describes it:

\[ P = c + dQ_S \]

where \( P \) is the price and \( Q_S \) is the quantity supplied. The \( c \) and \( d \) are positive constants.

The supply equation tells us three things:

1. The price at which sellers are not willing to supply the good (\( Q_S \) is zero). That is, if the price is \( c \), then no one is willing to sell the good. You can see the price \( c \) in Fig. 2. It is the price at which the supply curve hits the \( y \)-axis—what we call the supply curve’s “\( y \)-intercept.”
2. As the price rises, the quantity supplied increases. If \( Q_S \) is a positive number, then the price \( P \) must be greater than \( c \). As \( Q_S \) increases, the price \( P \) becomes larger. That is, as the quantity increases, the minimum price that sellers are willing to accept for the last unit rises.
3. The constant \( d \) tells us how fast the minimum price at which someone is willing to sell the good rises as the quantity increases. That is, the constant \( d \) tells us about the steepness of the supply curve. The equation tells us that the slope of the supply curve is \( d \).

Demand Curve

The law of demand says that as the price of a good or service falls, the quantity demanded of that good or service increases. We can illustrate the law of demand by drawing a graph of the demand curve or writing down an equation. When the demand curve is a straight line, the following equation describes it:

\[ P = a - bQ_D \]

where \( P \) is the price and \( Q_D \) is the quantity demanded. The \( a \) and \( b \) are positive constants.

The demand equation tells us three things:

1. The price at which no one is willing to buy the good (\( Q_D \) is zero). That is, if the price is \( a \), then the quantity demanded is zero. You can see the price \( a \) in Fig. 1. It is the price at which the demand curve hits the \( y \)-axis—what we call the demand curve’s “\( y \)-intercept.”
2. As the price falls, the quantity demanded increases. If \( Q_D \) is a positive number, then the price \( P \) must be less than \( a \). As \( Q_D \) gets larger, the price \( P \) becomes smaller. That is, as the quantity increases, the maximum price that buyers are willing to pay for the last unit of the good falls.
3. The constant \( b \) tells us how fast the maximum price that someone is willing to pay for the good falls as the quantity increases. That is, the constant \( b \) tells us about the steepness of the demand curve. The equation tells us that the slope of the demand curve is \(-b\).
Using the demand equation, we have
\[ P^* = a - b \left( \frac{a - c}{b + d} \right) \]
\[ P^* = \frac{a(b + d) - b(a - c)}{b + d} \]
\[ P^* = \frac{ad + bc}{b + d} \]
Alternatively, using the supply equation, we have
\[ P^* = c + d \left( \frac{a - c}{b + d} \right) \]
\[ P^* = \frac{c(b + d) + d(a - c)}{b + d} \]
\[ P^* = \frac{ad + bc}{b + d} \]

**An Example**

The demand for ice-cream cones is
\[ P = 800 - 2Q_D. \]
The supply of ice-cream cones is
\[ P = 200 + 1Q_S. \]
The price of a cone is expressed in cents, and the quantities are expressed in cones per day.

To find the equilibrium price \((P^*)\) and equilibrium quantity \((Q^*)\), substitute \(Q^*\) for \(Q_D\) and \(Q^*\) for \(Q_S\) and \(P^*\) for \(P\). That is,
\[ P^* = 800 - 2Q^* \]
\[ P^* = 200 + Q^* \]

Now solve for \(Q^*\):
\[ 800 - 2Q^* = 200 + 1Q^* \]
\[ 600 = 3Q^* \]
\[ Q^* = 200. \]

And
\[ P^* = 800 - 2 \left( 200 \right) \]
\[ = 400. \]

The equilibrium price is $4 a cone, and the equilibrium quantity is 200 cones per day.
CHAPTER 3 Demand and Supply

Key Points

Markets and Prices (p. 56)
- A competitive market is one that has so many buyers and sellers that no single buyer or seller can influence the price.
- Opportunity cost is a relative price.
- Demand and supply determine relative prices.

Working Problem 1 will give you a better understanding of markets and prices.

Demand (pp. 57–61)
- Demand is the relationship between the quantity demanded of a good and its price when all other influences on buying plans remain the same.
- The higher the price of a good, other things remaining the same, the smaller is the quantity demanded—the law of demand.
- Demand depends on the prices of related goods (substitutes and complements), expected future prices, income, expected future income and credit, the population, and preferences.

Working Problems 2 to 5 will give you a better understanding of demand.

Supply (pp. 62–65)
- Supply is the relationship between the quantity supplied of a good and its price when all other influences on selling plans remain the same.
- The higher the price of a good, other things remaining the same, the greater is the quantity supplied—the law of supply.
- Supply depends on the prices of factors of production used to produce a good, the prices of related goods produced, expected future prices, the number of suppliers, technology, and the state of nature.

Working Problems 6 to 9 will give you a better understanding of supply.

Market Equilibrium (pp. 66–67)
- At the equilibrium price, the quantity demanded equals the quantity supplied.
- At any price above the equilibrium price, there is a surplus and the price falls.
- At any price below the equilibrium price, there is a shortage and the price rises.

Working Problems 10 and 11 will give you a better understanding of market equilibrium.

Predicting Changes in Price and Quantity (pp. 68–73)
- An increase in demand brings a rise in the price and an increase in the quantity demanded. A decrease in demand brings a fall in the price and a decrease in the quantity supplied.
- An increase in supply brings a fall in the price and an increase in the quantity demanded. A decrease in supply brings a rise in the price and a decrease in the quantity demanded.
- An increase in demand and an increase in supply bring an increased quantity but an uncertain price change. An increase in demand and a decrease in supply bring a higher price but an uncertain change in quantity.

Working Problems 12 and 13 will give you a better understanding of predicting changes in price and quantity.

Key Terms

Change in demand, 58
Change in supply, 63
Change in the quantity demanded, 61
Change in the quantity supplied, 64
Competitive market, 56
Complement, 59
Demand, 57
Demand curve, 58
Equilibrium price, 66
Equilibrium quantity, 66
Inferior good, 60
Law of demand, 57
Law of supply, 62
Money price, 56
Normal good, 60
Quantity demanded, 57
Quantity supplied, 62
Relative price, 56
Substitute, 59
Supply, 62
Supply curve, 62
Markets and Prices (Study Plan 3.1)

1. William Gregg owned a mill in South Carolina. In December 1862, he placed a notice in the Edgehill Advertiser announcing his willingness to exchange cloth for food and other items. Here is an extract:
   1 yard of cloth for 1 pound of bacon
   2 yards of cloth for 1 pound of butter
   4 yards of cloth for 1 pound of wool
   8 yards of cloth for 1 bushel of salt
   a. What is the relative price of butter in terms of wool?
   b. If the money price of bacon was 20¢ a pound, what do you predict was the money price of butter?
   c. If the money price of bacon was 20¢ a pound and the money price of salt was $2.00 a bushel, do you think anyone would accept Mr. Gregg’s offer of cloth for salt?

Demand (Study Plan 3.2)

2. The price of food increased during the past year.
   a. Explain why the law of demand applies to food just as it does to all other goods and services.
   b. Explain how the substitution effect influences food purchases and provide some examples of substitutions that people might make when the price of food rises and other things remain the same.
   c. Explain how the income effect influences food purchases and provide some examples of the income effect that might occur when the price of food rises and other things remain the same.

3. Place the following goods and services into pairs of likely substitutes and pairs of likely complements. (You may use an item in more than one pair.) The goods and services are:
   - coal, oil, natural gas, wheat, corn, rye, pasta, pizza, sausage, skateboard, roller blades, video game, laptop, iPod, cell phone, text message, email, phone call, voice mail

4. During 2010, the average income in China increased by 10 percent. Compared to 2009, how do you expect the following would change:
   a. The demand for beef. Explain your answer.
   b. The demand for rice. Explain your answer.

5. In January 2010, the price of gasoline was $2.70 a gallon. By spring 2010, the price had increased to $3.00 a gallon. Assume that there were no changes in average income, population, or any other influence on buying plans. Explain how the rise in the price of gasoline would affect:
   a. The demand for gasoline.
   b. The quantity of gasoline demanded.

Supply (Study Plan 3.3)

6. In 2008, the price of corn increased by 35 percent and some cotton farmers in Texas stopped growing cotton and started to grow corn.
   a. Does this fact illustrate the law of demand or the law of supply? Explain your answer.
   b. Why would a cotton farmer grow corn?

Use the following information to work Problems 7 to 9.
Dairies make low-fat milk from full-cream milk. In the process of making low-fat milk, the dairies produce cream, which is made into ice cream. In the market for low-fat milk, the following events occur one at a time:

   (i) The wage rate of dairy workers rises.
   (ii) The price of cream rises.
   (iii) The price of low-fat milk rises.
   (iv) With the period of low rainfall extending, dairies raise their expected price of low-fat milk next year.
   (v) With advice from health-care experts, dairy farmers decide to switch from producing full-cream milk to growing vegetables.
   (vi) A new technology lowers the cost of producing ice cream.

7. Explain the effect of each event on the supply of low-fat milk.

8. Use a graph to illustrate the effect of each event.

9. Does any event (or events) illustrate the law of supply?
Market Equilibrium (Study Plan 3.4)

10. “As more people buy computers, the demand for Internet service increases and the price of Internet service decreases. The fall in the price of Internet service decreases the supply of Internet service.” Explain what is wrong with this statement.

11. The demand and supply schedules for gum are

<table>
<thead>
<tr>
<th>Price (cents per pack)</th>
<th>Quantity demanded (millions of packs a week)</th>
<th>Quantity supplied (millions of packs a week)</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td>180</td>
<td>60</td>
</tr>
<tr>
<td>40</td>
<td>140</td>
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</tr>
<tr>
<td>60</td>
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<tr>
<td>80</td>
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<td>180</td>
</tr>
<tr>
<td>100</td>
<td>20</td>
<td>220</td>
</tr>
</tbody>
</table>

a. Draw a graph of the market for gum and mark in the equilibrium price and quantity.
b. Suppose that the price of gum is 70¢ a pack. Describe the situation in the gum market and explain how the price adjusts.
c. Suppose that the price of gum is 30¢ a pack. Describe the situation in the gum market and explain how the price adjusts.

Predicting Changes in Price and Quantity (Study Plan 3.5)

12. The following events occur one at a time:
   (i) The price of crude oil rises.
   (ii) The price of a car rises.
   (iii) All speed limits on highways are abolished.
   (iv) Robots cut car production costs.
Which of these events will increase or decrease (state which occurs)
   a. The demand for gasoline?
   b. The supply of gasoline?
   c. The quantity of gasoline demanded?
   d. The quantity of gasoline supplied?

13. In Problem 11, a fire destroys some factories that produce gum and the quantity of gum supplied decreases by 40 million packs a week at each price.
a. Explain what happens in the market for gum and draw a graph to illustrate the changes.
b. If at the time the fire occurs there is an increase in the teenage population, which increases the quantity of gum demanded by 40 million packs a week at each price, what are the new equilibrium price and quantity of gum? Illustrate these changes on your graph.

14. Indian Weddings Boost Gold Price Hopes
Indian weddings traditionally take place between late September and December. The predilection for jewelry at this time usually gives a big boost to gold sales, and the record shows the price of gold has generally risen during this period.

a. Describe the changes in demand and supply in the market for gold in India during the wedding season.
b. Given that the wedding season is a predictable event, how might expectations influence the market for gold in India?

15. Pump Prices on Pace to Top 2009 High by Weekend
The cost of filling up the car is rising as the crude oil price soars and pump prices may exceed the peak price of 2009.

Source: USA Today, January 7, 2010
a. Does demand for or the supply of gasoline or both change when the price of oil soars?
b. Use a demand-supply graph to illustrate what happens to the equilibrium price of gasoline and the equilibrium quantity of gasoline bought when the price of oil soars.

16. American to Cut Flights, Charge for Luggage
American Airlines announced that it will charge passengers $15 for their first piece of checked luggage and cut domestic flights as it grapples with record-high fuel prices.

Source: Boston Herald, May 22, 2008
a. According to the news clip, what is the influence on the supply of American Airlines flights?
b. Explain how supply changes.

17. Frigid Florida Winter is Bad News for Tomato Lovers
An unusually cold January in Florida destroyed entire fields of tomatoes. Florida’s growers are shipping only a quarter of their usual 5 million pounds a week. The price has risen from $6.50 for a 25-pound box a year ago to $30 now.

Source: USA Today, March 3, 2010
a. Make a graph to illustrate the market for tomatoes in January 2009 and January 2010.
b. On the graph, show how the events in the news clip influence the market for tomatoes.
c. Why is the news “bad for tomato lovers?”
Markets and Prices
18. What features of the world market for crude oil make it a competitive market?
19. The money price of a textbook is $90 and the money price of the Wii game Super Mario Galaxy is $45.
   a. What is the opportunity cost of a textbook in terms of the Wii game?
   b. What is the relative price of the Wii game in terms of textbooks?

Demand
20. The price of gasoline has increased during the past year.
   a. Explain why the law of demand applies to gasoline just as it does to all other goods and services.
   b. Explain how the substitution effect influences gasoline purchases and provide some examples of substitutions that people might make when the price of gasoline rises and other things remain the same.
   c. Explain how the income effect influences gasoline purchases and provide some examples of the income effects that might occur when the price of gasoline rises and other things remain the same.

21. Think about the demand for the three game consoles: Xbox, PS3, and Wii. Explain the effect of the following events on the demand for Xbox games and the quantity of Xbox games demanded, other things remaining the same.
   a. The price of an Xbox falls.
   b. The prices of a PS3 and a Wii fall.
   c. The number of people writing and producing Xbox games increases.
   d. Consumers’ incomes increase.
   e. Programmers who write code for Xbox games become more costly to hire.
   f. The expected future price of an Xbox game falls.
   g. A new game console that is a close substitute for Xbox comes onto the market.

Supply
22. Classify the following pairs of goods and services as substitutes in production, complements in production, or neither.
   a. Bottled water and health club memberships
   b. French fries and baked potatoes
   c. Leather purses and leather shoes
   d. Hybrids and SUVs
   e. Diet coke and regular coke

23. As the prices of homes fell across the United States in 2008, the number of homes offered for sale decreased.
   a. Does this fact illustrate the law of demand or the law of supply? Explain your answer.
   b. Why would home owners decide not to sell?

24. G.M. Cuts Production for Quarter
   General Motors cut its fourth-quarter production schedule by 10 percent because Ford Motor, Chrysler, and Toyota sales declined in August.
   Explain whether this news clip illustrates a change in the supply of cars or a change in the quantity supplied of cars.

Market Equilibrium
Use the following figure to work Problems 25 and 26.

25. a. Label the curves. Which curve shows the willingness to pay for a pizza?
    b. If the price of a pizza is $16, is there a shortage or a surplus and does the price rise or fall?
c. Sellers want to receive the highest possible price, so why would they be willing to accept less than $16 a pizza?

26. a. If the price of a pizza is $12, is there a shortage or a surplus and does the price rise or fall?
   b. Buyers want to pay the lowest possible price, so why would they be willing to pay more than $12 for a pizza?

27. The demand and supply schedules for potato chips are

<table>
<thead>
<tr>
<th>Price (cents per bag)</th>
<th>Quantity demanded (millions of bags per week)</th>
<th>Quantity supplied (millions of bags per week)</th>
</tr>
</thead>
<tbody>
<tr>
<td>50</td>
<td>160</td>
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<td>170</td>
</tr>
<tr>
<td>100</td>
<td>110</td>
<td>180</td>
</tr>
</tbody>
</table>

a. Draw a graph of the potato chip market and mark the equilibrium price and quantity.
   b. If the price is 60¢ a bag, is there a shortage or a surplus, and how does the price adjust?

Predicting Changes in Price and Quantity

28. In Problem 27, a new dip increases the quantity of potato chips that people want to buy by 30 million bags per week at each price.
   a. Does the demand for chips change? Does the supply of chips change? Describe the change.
   b. How do the equilibrium price and equilibrium quantity of chips change?

29. In Problem 27, if a virus destroys potato crops and the quantity of potato chips produced decreases by 40 million bags a week at each price, how does the supply of chips change?

30. If the virus in Problem 29 hits just as the new dip in Problem 28 comes onto the market, how do the equilibrium price and equilibrium quantity of chips change?

31. Strawberry Prices Drop as Late Harvest Hits Market

Shoppers bought strawberries in March for $1.25 a pound rather than the $3.49 a pound they paid last year. With the price so low, some growers plowed over their strawberry plants to make way for spring melons; others froze their harvests and sold them to juice and jam makers.

Source: USA Today, April 5, 2010

a. Explain how the market for strawberries would have changed if growers had not plowed in their plants but offered locals “you pick for free.”

b. Describe the changes in demand and supply in the market for strawberry jam.

32. “Popcorn Movie” Experience Gets Pricier

Cinemas are raising the price of popcorn. Demand for field corn, which is used for animal feed, corn syrup, and ethanol, has increased and its price has exploded. That’s caused some farmers to shift from growing popcorn to easier-to-grow field corn.

Source: USA Today, May 24, 2008

Explain and illustrate graphically the events described in the news clip in the market for
a. Popcorn
b. Movie tickets

33. Watch Out for Rising Dry-Cleaning Bills

In the past year, the price of dry-cleaning solvent doubled. More than 4,000 dry cleaners across the United States disappeared as budget-conscious consumers cut back. This year the price of hangers used by dry cleaners is expected to double.

Source: CNN Money, June 4, 2012

a. Explain the effect of rising solvent prices on the market for dry cleaning.
   b. Explain the effect of consumers becoming more budget conscious along with the rising price of solvent on the price of dry cleaning.
   c. If the price of hangers does rise this year, do you expect additional dry cleaners to disappear? Explain why or why not.

Economics in the News

34. After you have studied Reading Between the Lines on pp. 74–75, answer the following questions.
   a. What happened to the price of peanut butter in 2011?
   b. What substitutions do you expect might have been made to decrease the quantity of peanut butter demanded?
   c. What is the main complement of peanut butter and what do you predict happened in its market in 2011?
   d. What is one of the main substitutes in production for peanuts and what do you predict happened in its market in 2011?
   e. Do you predict that the higher prices of peanuts and peanut butter will persist or will they return to normal after one year?
   f. Why did the percentage rise in the price of peanuts exceed the percentage rise in the price of peanut butter?
In the winter of 2010, a Florida frost destroyed the state’s tomato crop, driving the price to almost five times its normal level. Why did the price rise so much?

To answer this and similar questions, we use the neat tool that you study in this chapter: elasticity.

At the end of the chapter, in Reading Between the Lines, we use the concept of elasticity to explain what was happening in the Florida tomatoes market during the winter of 2010. But we begin by explaining elasticity in a familiar setting: the market for pizza.

After studying this chapter, you will be able to:

- Define, calculate, and explain the factors that influence the price elasticity of demand
- Define, calculate, and explain the factors that influence the income elasticity of demand and the cross elasticity of demand
- Define, calculate, and explain the factors that influence the elasticity of supply
Price Elasticity of Demand

You know that when supply decreases, the equilibrium price rises and the equilibrium quantity decreases. But does the price rise by a large amount and the quantity decrease by a little? Or does the price barely rise and the quantity decrease by a large amount?

The answer depends on the responsiveness of the quantity demanded of a good to a change in its price. If the quantity demanded is not very responsive to a change in the price, the price rises a lot and the equilibrium quantity doesn’t change much. If the quantity demanded is very responsive to a change in the price, the price barely rises and the equilibrium quantity changes a lot.

You might think about the responsiveness of the quantity demanded of a good to a change in its price in terms of the slope of the demand curve. If the demand curve is steep, the quantity demanded of the good isn’t very responsive to a change in the price. If the demand curve is almost flat, the quantity demanded is very responsive to a change in the price.

But the slope of a demand curve depends on the units in which we measure the price and the quantity—we can make the curve steep or almost flat just by changing the units in which we measure the price and the quantity. Also we often want to compare the demand for different goods and services and quantities of these goods are measured in unrelated units. For example, a pizza producer might want to compare the demand for pizza with the demand for soft drinks. Which quantity demanded is more responsive to a price change? This question can’t be answered by comparing the slopes of two demand curves. The units of measurement of pizza and soft drinks are unrelated. But the question can be answered with a measure of responsiveness that is independent of units of measurement. Elasticity is such a measure.

The price elasticity of demand is a units-free measure of the responsiveness of the quantity demanded of a good to a change in its price when all other influences on buying plans remain the same.

Calculating Price Elasticity of Demand

We calculate the price elasticity of demand by using the formula:

\[
\text{Price elasticity of demand} = \frac{\text{Percentage change in quantity demanded}}{\text{Percentage change in price}}
\]

To calculate the price elasticity of demand for pizza, we need to know the quantity demanded of pizza at two different prices, when all other influences on buying plans remain the same.

Figure 4.1 zooms in on a section of the demand curve for pizza and shows how the quantity demanded responds to a small change in price. Initially, the price is $20.50 a pizza and 9 pizzas an hour are demanded—the original point. The price then falls to $19.50 a pizza, and the quantity demanded increases to 11 pizzas an hour—the new point. When the price falls by $1 a pizza, the quantity demanded increases by 2 pizzas an hour.

To calculate the price elasticity of demand, we express the change in price as a percentage of the average price and the change in the quantity demanded as a percentage of the average quantity. By using the average price and average quantity, we calculate the elasticity at a point on the demand curve midway between the original point and the new point.

The original price is $20.50 and the new price is $19.50, so the price change is $1 and the average price is $20 a pizza. Call the percentage change in the price \(\% \Delta P\), then

\[
\% \Delta P = \frac{\Delta P}{P_{\text{ave}}} \times 100 = \frac{(1/20)}{20} \times 100 = 5\%.
\]

The original quantity demanded is 9 pizzas and the new quantity demanded is 11 pizzas, so the quantity change is 2 pizzas and the average quantity demanded is 10 pizzas. Call the percentage change in the quantity demanded \(\% \Delta Q\), then

\[
\% \Delta Q = \frac{\Delta Q}{Q_{\text{ave}}} \times 100 = \frac{(2/10)}{10} \times 100 = 20\%.
\]

The price elasticity of demand equals the percentage change in the quantity demanded (20 percent) divided by the percentage change in price (5 percent) and is 4. That is,

\[
\text{Price elasticity of demand} = \frac{\% \Delta Q}{\% \Delta P} = \frac{20\%}{5\%} = 4.
\]

Average Price and Quantity Notice that we use the average price and average quantity. We do this because it gives the most precise measurement of elasticity—at the midpoint between the original price and the new price. If the price falls from $20.50 to $19.50, the $1 price change is 4.9 percent of $20.50. The 2 pizza change in quantity is 22.2 percent of 9 pizzas, the original quantity. So if we use
Price Elasticity of Demand

Percentages and Proportions  Elasticity is the ratio of two percentage changes, so when we divide one percentage change by another, the 100s cancel. A percentage change is a proportionate change multiplied by 100. The proportionate change in price is $\frac{\Delta P}{P_{ave}}$ and the proportionate change in quantity demanded is $\frac{\Delta Q}{Q_{ave}}$. So if we divide $\frac{\Delta Q}{Q_{ave}}$ by $\frac{\Delta P}{P_{ave}}$, we get the same answer as we get by using percentage changes.

A Units-Free Measure  Now that you’ve calculated a price elasticity of demand, you can see why it is a units-free measure. Elasticity is a units-free measure because the percentage change in each variable is independent of the units in which the variable is measured. The ratio of the two percentages is a number without units.

Minus Sign and Elasticity  When the price of a good rises, the quantity demanded decreases. Because a positive change in price brings a negative change in the quantity demanded, the price elasticity of demand is a negative number. But it is the magnitude, or absolute value, of the price elasticity of demand that tells us how responsive the quantity demanded is. So to compare price elasticities of demand, we use the magnitude of the elasticity and ignore the minus sign.

Inelastic and Elastic Demand  If the quantity demanded remains constant when the price changes, then the price elasticity of demand is zero and the good is said to have a perfectly inelastic demand. One good that has a very low price elasticity of demand (perhaps zero over some price range) is insulin. Insulin is of such importance to some diabetics that if the price rises or falls, they do not change the quantity they buy.

If the percentage change in the quantity demanded equals the percentage change in price, then the price elasticity equals 1 and the good is said to have a unit elastic demand. Food and shelter are examples of goods with inelastic demand.

If the quantity demanded changes by an infinitely large percentage in response to a tiny price change, then the price elasticity of demand is infinity and the good is said to have a perfectly elastic demand. An example of a good that has a very high elasticity of

---

These numbers, the price elasticity of demand is 22.2 divided by 4.9, which equals 4.5. But if the price rises from $19.50 to $20.50, the $1 price change is 5.1 percent of $19.50. The 2 pizza change in quantity is 18.2 percent of 11 pizzas, the original quantity. So if we use these numbers, the price elasticity of demand is 18.2 divided by 5.1, which equals 3.6.

By using percentages of the average price and average quantity, we get the same value for the elasticity regardless of whether the price falls from $20.50 to $19.50 or rises from $19.50 to $20.50.

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MyEconLab animation
demand (almost infinite) is a soft drink from two
campus machines located side by side. If the two
machines offer the same soft drinks for the same
price, some people buy from one machine and some
from the other. But if one machine’s price is higher
than the other’s, by even a small amount, no one
buys from the machine with the higher price. Drinks
from the two machines are perfect substitutes. The
demand for a good that has a perfect substitute is
perfectly elastic.

Between unit elastic demand and perfectly elastic
demand is another general case in which the percentage change in the quantity demanded exceeds the percentage change in price. In this case, the price elasticity of demand is greater than 1 and the good is said to have an elastic demand. Automobiles and furniture are examples of goods that have elastic demand.

Figure 4.2 shows three demand curves that cover
the entire range of possible elasticities of demand that
you’ve just reviewed. In Fig. 4.2(a), the quantity
demanded is constant regardless of the price, so this
demand is perfectly inelastic. In Fig. 4.2(b), the percentage change in the quantity demanded equals the percentage change in price, so this demand is unit elastic. In Fig. 4.2(c), the price is constant regardless of the quantity demanded, so this figure illustrates a perfectly elastic demand.

You now know the distinction between elastic and
inelastic demand. But what determines whether the
demand for a good is elastic or inelastic?

### The Factors that Influence the Elasticity of Demand

The elasticity of demand for a good depends on
- The closeness of substitutes
- The proportion of income spent on the good
- The time elapsed since the price change

**Closeness of Substitutes** The closer the substitutes for a good, the more elastic is the demand for it. Oil as fuel or raw material for chemicals has no close substitutes so the demand for oil is inelastic. Plastics are close substitutes for metals, so the demand for metals is elastic.

The degree of substitutability depends on how narrowly (or broadly) we define a good. For example, a personal computer has no close substitutes, but a Dell PC is a close substitute for a Hewlett-Packard PC. So the elasticity of demand for personal computers is lower than the elasticity of demand for a Dell or a Hewlett-Packard.

In everyday language we call goods such as food
and shelter necessities and goods such as exotic vacations luxuries. A necessity has poor substitutes, so it generally has an inelastic demand. A luxury usually has many substitutes, one of which is not buying it. So a luxury generally has an elastic demand.

**Proportion of Income Spent on the Good** Other things remaining the same, the greater the proportion of income spent on a good, the more elastic (or less inelastic) is the demand for it.

---

**FIGURE 4.2** Inelastic and Elastic Demand

(a) Perfectly inelastic demand
(b) Unit elastic demand
(c) Perfectly elastic demand

Each demand illustrated here has a constant elasticity. The demand curve in part (a) illustrates the demand for a good that has a zero elasticity of demand. The demand curve in part (b) illustrates the demand for a good with a unit elasticity of demand. And the demand curve in part (c) illustrates the demand for a good with an infinite elasticity of demand.
Think about your own elasticity of demand for chewing gum and housing. If the price of gum rises, you consume almost as much as before. Your demand for gum is inelastic. If apartment rents rise, you look for someone to share with. Your demand for housing is not as inelastic as your demand for gum. Why the difference? Housing takes a big chunk of your budget, and gum takes little. You barely notice the higher price of gum, while the higher rent puts your budget under severe strain.

**Time Elapsed Since Price Change**  The longer the time that has elapsed since a price change, the more elastic is demand. When the price of oil increased by 400 percent during the 1970s, people barely changed the quantity of oil and gasoline they bought. But gradually, as more efficient auto and airplane engines were developed, the quantity bought decreased. The demand for oil became more elastic as more time elapsed following the huge price hike.

**Elasticity Along a Linear Demand Curve**
Elasticity of demand is not the same as slope. And a good way to see this fact is by studying a demand curve that has a constant slope but a varying elasticity.

The demand curve in Fig. 4.3 is linear, which means that it has a constant slope. Along this demand curve, a $5 rise in the price brings a decrease of 10 pizzas an hour.

But the price elasticity of demand is not constant along this demand curve. To see why, let’s calculate some elasticities.

At the midpoint of the demand curve, the price is $12.50 and the quantity is 25 pizzas per hour. If the price rises from $10 to $15 a pizza the quantity demanded decreases from 30 to 20 pizzas an hour and the average price and average quantity are at the midpoint of the demand curve. So

\[
\text{Price elasticity of demand} = \frac{10/25}{5/12.50} = 1.
\]

That is, at the midpoint of a linear demand curve, the price elasticity of demand is 1.

At prices above the midpoint, the price elasticity of demand is greater than 1: Demand is elastic. To see that demand is elastic, let’s calculate the elasticity when the price rises from $15 to $25 a pizza. You can see that quantity demanded decreases from 20 to zero pizzas an hour. The average price is $20 a pizza, and

\[
\text{Price elasticity of demand} = \frac{20/40}{10/5} = 1/4.
\]

That is, the price elasticity of demand at an average price of $5 a pizza is 1/4.
Total Revenue and Elasticity

The total revenue from the sale of a good equals the price of the good multiplied by the quantity sold. When a price changes, total revenue also changes. But a cut in the price does not always decrease total revenue. The change in total revenue depends on the elasticity of demand in the following way:

- If demand is elastic, a 1 percent price cut increases the quantity sold by more than 1 percent and total revenue increases.
- If demand is inelastic, a 1 percent price cut increases the quantity sold by less than 1 percent and total revenue decreases.
- If demand is unit elastic, a 1 percent price cut increases the quantity sold by 1 percent and total revenue does not change.

In Fig. 4.4(a), over the price range from $25 to $12.50, demand is elastic. Over the price range from $12.50 to zero, demand is inelastic. At a price of $12.50, demand is unit elastic.

Figure 4.4(b) shows total revenue. At a price of $25, the quantity sold is zero, so total revenue is zero. At a price of zero, the quantity demanded is 50 pizzas an hour and total revenue is again zero. A price cut in the elastic range brings an increase in total revenue—the percentage increase in the quantity demanded is greater than the percentage decrease in price. A price cut in the inelastic range brings a decrease in total revenue—the percentage increase in the quantity demanded is less than the percentage decrease in price. At unit elasticity, total revenue is at a maximum.

Figure 4.4 shows how we can use this relationship between elasticity and total revenue to estimate elasticity using the total revenue test. The total revenue test is a method of estimating the price elasticity of demand by observing the change in total revenue that results from a change in the price, when all other influences on the quantity sold remain the same.

- If a price cut increases total revenue, demand is elastic.
- If a price cut decreases total revenue, demand is inelastic.
- If a price cut leaves total revenue unchanged, demand is unit elastic.
**Economics in Action**

**Elastic and Inelastic Demand**

The real-world price elasticities of demand in the table range from 1.52 for metals, the item with the most elastic demand in the table, to 0.05 for oil, the item with the most inelastic demand in the table. The demand for food is also inelastic.

Oil and food, which have poor substitutes and inelastic demand, might be classified as necessities. Furniture and motor vehicles, which have good substitutes and elastic demand, might be classified as luxuries.

<table>
<thead>
<tr>
<th>Price Elasticities of Demand for Food</th>
<th>Elasticity</th>
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</tr>
<tr>
<td>Tomatoes (Florida winter)</td>
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<tr>
<td>Tomatoes (All Types)</td>
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<tr>
<td>Carrots</td>
<td>1.0</td>
</tr>
</tbody>
</table>

**Price Elasticities of Demand for Food**

The price elasticity of demand for food in the United States is estimated to be 0.12. This elasticity is an average over all types of food. The demand for most food items is inelastic, but there is a wide range of elasticities as the figure below shows for a range of fruits, vegetables, and meats.

The demand for grapes and beef is elastic. The demand for oranges is unit elastic. These food items, especially grapes and beef, have many good substitutes. Florida winter tomatoes have closer substitutes than tomatoes in general, so the demand for the Florida winter variety is more elastic (less inelastic) than the demand for tomatoes.

Carrots and cabbage, on which we spend a very small proportion of income, have an almost zero elastic demand.


CHAPTER 4 Elasticity

Your Expenditure and Your Elasticity

When the price of a good changes, the change in your expenditure on the good depends on your elasticity of demand.

- If your demand for the good is elastic, a 1 percent price cut increases the quantity you buy by more than 1 percent and your expenditure on the item increases.
- If your demand for the good is inelastic, a 1 percent price cut increases the quantity you buy by less than 1 percent and your expenditure on the item decreases.
- If your demand for the good is unit elastic, a 1 percent price cut increases the quantity you buy by 1 percent and your expenditure on the item does not change.

So if you spend more on an item when its price falls, your demand for that item is elastic; if you spend the same amount, your demand is unit elastic; and if you spend less, your demand is inelastic.

ECONOMICS IN THE NEWS

The Elasticity of Demand for Peanut Butter

Peanut Butter Prices to Rise 30 to 40 Percent

Scott Karns, president and CEO of Karns Foods, said “People are still going to need it for their family. It’s still an extremely economical item.” Patry Nolan, who is on a fixed income, said “I love peanut butter so I’m using a little less so I don’t go through it.”

Source: The Patriot-News, November 2, 2011

THE DATA

<table>
<thead>
<tr>
<th>Year</th>
<th>Quantity (millions of tons per year)</th>
<th>Price (dollars per pound)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2011</td>
<td>350</td>
<td>2.00</td>
</tr>
<tr>
<td>2012</td>
<td>300</td>
<td>2.80</td>
</tr>
</tbody>
</table>

THE QUESTIONS

- Does the news clip imply that the demand for peanut butter is elastic or inelastic?
- If the data are two points on the demand curve for peanut butter, what is the price elasticity of demand?

THE ANSWERS

- The two remarks in the news clip suggest that the quantity of peanut butter demanded will decrease when the price rises, but not by much. The demand for peanut butter is inelastic.

Calculating the Price Elasticity of Demand for Peanut Butter

\[ \text{Elasticity} = \frac{0.46}{33.3\%} = 0.00138\%

The data table says the price of peanut butter increased by $0.80 with an average price of $2.40, so the price increased by 33.3 percent. The quantity demanded decreased by 50 million tons with an average quantity of 325 million tons, so the quantity demanded decreased by 15.4 percent. The price elasticity of demand is 15.4 percent divided by 33.3 percent, which equals 0.46.

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More Elasticities of Demand

Suppose the economy is expanding and people are enjoying rising incomes. You know that a change in income changes demand. So this increased prosperity brings an increase in the demand for most types of goods and services. By how much will a rise in income increase the demand for pizza? This question is answered by the income elasticity of demand.

Income Elasticity of Demand
The income elasticity of demand is a measure of the responsiveness of the demand for a good or service to a change in income, other things remaining the same. It tells us by how much a demand curve shifts at a given price.

The income elasticity of demand is calculated by using the formula:

\[
\text{Income elasticity of demand} = \frac{\text{Percentage change in quantity demanded}}{\text{Percentage change in income}}
\]

Income elasticities of demand can be positive or negative and they fall into three interesting ranges:
- Positive and greater than 1 (normal good, income elastic)
- Positive and less than 1 (normal good, income inelastic)
- Negative (inferior good)

Income Elastic Demand Suppose that the price of pizza is constant and 9 pizzas an hour are bought. Then incomes rise from $975 to $1,025 a week. No other influence on buying plans changes and the quantity of pizzas sold increases to 11 an hour.

The change in the quantity demanded is +2 pizzas. The average quantity is 10 pizzas, so the quantity demanded increases by 20 percent. The change in income is +$50 and the average income is $1,000, so incomes increase by 5 percent. The income elasticity of demand for pizza is

\[
\frac{20\%}{5\%} = 4.
\]

The demand for pizza is income elastic. The percentage increase in the quantity of pizza demanded exceeds the percentage increase in income.

Economics in Action

Necessities and Luxuries
The table shows estimates of some real-world income elasticities of demand. The demand for a necessity such as food or clothing is income inelastic, while the demand for a luxury such as transportation, which includes airline and foreign travel, is income elastic.

But what is a necessity and what is a luxury depends on the level of income. For people with a low income, food and clothing can be luxuries. So the level of income has a big effect on income elasticities of demand. The figure shows this effect on the income elasticity of demand for food in 10 countries. In countries with low incomes, such as Tanzania and India, the income elasticity of demand for food is high. In countries with high incomes, such as the United States, the income elasticity of

<table>
<thead>
<tr>
<th>Income Elastic Demand</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Airline travel</td>
<td>3.41</td>
</tr>
<tr>
<td>Movies</td>
<td>3.08</td>
</tr>
<tr>
<td>Foreign travel</td>
<td>1.94</td>
</tr>
<tr>
<td>Electricity</td>
<td>1.61</td>
</tr>
<tr>
<td>Restaurant meals</td>
<td>1.38</td>
</tr>
<tr>
<td>Local buses and trains</td>
<td>1.36</td>
</tr>
<tr>
<td>Haircuts</td>
<td>1.07</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Income Inelastic Demand</th>
<th>0.86</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tobacco</td>
<td>0.62</td>
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<tr>
<td>Alcoholic drinks</td>
<td>0.53</td>
</tr>
<tr>
<td>Furniture</td>
<td>0.51</td>
</tr>
<tr>
<td>Clothing</td>
<td>0.38</td>
</tr>
<tr>
<td>Newspapers and magazines</td>
<td>0.32</td>
</tr>
<tr>
<td>Telephone</td>
<td>0.14</td>
</tr>
</tbody>
</table>

Cross Elasticity of Demand

The burger shop next to your pizzeria has just raised the prices of its burgers. You know that pizzas and burgers are substitutes. You also know that when the price of a substitute for pizza rises, the demand for pizza increases. But how big is the influence of the price of burgers on the demand for pizza?

You know, too, that pizza and soft drinks are complements. And you know that if the price of a complement of pizza rises, the demand for pizza decreases. So you wonder, by how much will a rise in the price of a soft drink decrease the demand for your pizza?

To answer this question, you need to know about the cross elasticity of demand for pizza. Let’s examine this elasticity measure.

We measure the influence of a change in the price of a substitute or complement by using the concept of the cross elasticity of demand. The cross elasticity of demand is a measure of the responsiveness of the demand for a good to a change in the price of a substitute or complement, other things remaining the same.

To calculate the cross elasticity of demand, we use the formula:

\[
\text{Cross elasticity of demand} = \frac{\text{Percentage change in quantity demanded}}{\text{Percentage change in price of a substitute or complement}}.
\]

The cross elasticity of demand can be positive or negative. If the cross elasticity of demand is positive, demand and the price of the other good change in the same direction, so the two goods are substitutes. If the cross elasticity of demand is negative, demand and the price of the other good change in opposite directions, so the two goods are complements.

Substitutes Suppose that the price of pizza is constant and people buy 9 pizzas an hour. Then the price of a burger rises from $1.50 to $2.50. No other influence on buying plans changes and the quantity of pizzas bought increases to 11 an hour.

The change in the quantity demanded at the current price is +2 pizzas—the new quantity, 11 pizzas, minus the original quantity, 9 pizzas. The average quantity is 10 pizzas. So the quantity of pizzas demanded increases by 20 percent. That is,

\[
\Delta Q/Q_{\text{ave}} \times 100 = (+2/10) \times 100 = +20\%.
\]
The change in the price of a burger, a substitute for pizza, is $1—the new price, $2.50, minus the original price, $1.50. The average price is $2 a burger. So the price of a burger rises by 50 percent. That is,

$$\frac{\Delta P}{P_{\text{ave}}} \times 100 = \frac{+1}{2} \times 100 = +50\%.$$ 

So the cross elasticity of demand for pizza with respect to the price of a burger is

$$\frac{+20\%}{+50\%} = 0.4.$$ 

Figure 4.5 illustrates the cross elasticity of demand. Because pizza and burgers are substitutes, when the price of a burger rises, the demand for pizza increases. The demand curve for pizza shifts rightward from \(D_0\) to \(D_1\). Because a rise in the price of a burger brings an increase in the demand for pizza, the cross elasticity of demand for pizza with respect to the price of a burger is positive. Both the price and the quantity change in the same direction.

**Complements** Now suppose that the price of pizza is constant and 11 pizzas an hour are bought. Then the price of a soft drink rises from $1.50 to $2.50. No other influence on buying plans changes and the quantity of pizzas bought falls to 9 an hour.

More Peanut Butter Demand Elasticities

Peanut Butter Related Markets

Professor Timothy Mathews teaches economics at Kennesaw State University, Georgia, the nation’s number one peanut producing state. The data table below shows his guesses about some demand elasticities for peanut butter.

**Source:** Timothy Mathews

**THE DATA**

- Income elasticity: −0.31
- Cross elasticity peanut butter and grape jelly: −0.27
- Cross elasticity peanut butter and American cheese: +0.18

**THE QUESTIONS**

- What do the data provided tell us about the demand for peanut butter? Is it a normal good?

**THE ANSWERS**

- Is grape jelly a substitute for or a complement of peanut butter? Is American cheese a substitute for or a complement of peanut butter?

**THE ANSWERS**

- The income elasticity of demand for peanut butter is negative, which means that peanut butter is an inferior good. People buy less peanut butter as income rises.

- The cross elasticity of demand of peanut butter with respect to the price of grape jelly is negative, which means that peanut butter and grape jelly are complements.

- The cross elasticity of demand of peanut butter with respect to the price of American cheese is positive, which means that peanut butter and American cheese are substitutes.
CHAPTER 4 Elasticity

You know that when demand increases, the equilibrium price rises and the equilibrium quantity increases. But does the price rise by a large amount and the quantity increase by a little? Or does the price barely rise and the quantity increase by a large amount?

The answer depends on the responsiveness of the quantity supplied to a change in the price. If the quantity supplied is not very responsive to price, then an increase in demand brings a large rise in the price and a small increase in the equilibrium quantity. If the quantity supplied is highly responsive to price, then an increase in demand brings a small rise in the price and a large increase in the equilibrium quantity.

The problems that arise from using the slope of the supply curve to indicate responsiveness are the same as those we considered when discussing the responsiveness of the quantity demanded, so we use a units-free measure—the elasticity of supply.

Calculating the Elasticity of Supply

The elasticity of supply measures the responsiveness of the quantity supplied to a change in the price of a good when all other influences on selling plans remain the same. It is calculated by using the formula:

\[
\text{Elasticity of supply} = \frac{\text{Percentage change in quantity supplied}}{\text{Percentage change in price}}.
\]

We use the same method that you learned when you studied the elasticity of demand. (Refer back to p. 85 to check this method.)

Elastic and Inelastic Supply

If the elasticity of supply is greater than 1, we say that supply is elastic and if the elasticity of supply is less than 1, we say that supply is inelastic.

Suppose that when the price rises from $20 to $21, the quantity supplied increases from 10 to 20 pizzas per hour. The price rise is $1 and the average price is $20.50, so the price rises by 4.9 percent of the average price. The quantity increases from 10 to 20 pizzas an hour, so the increase is 10 pizzas, the average quantity is 15 pizzas, and the quantity

**REVIEW QUIZ**

1. What does the income elasticity of demand measure?
2. What does the sign (positive/negative) of the income elasticity tell us about a good?
3. What does the cross elasticity of demand measure?
4. What does the sign (positive/negative) of the cross elasticity of demand tell us about the relationship between two goods?

You can work these questions in Study Plan 4.2 and get instant feedback. MyEconLab
The Factors That Influence the Elasticity of Supply

The elasticity of supply of a good depends on

- Resource substitution possibilities
- Time frame for the supply decision

Resource Substitution Possibilities

Some goods and services can be produced only by using unique or rare productive resources. These items have a low, perhaps even a zero, elasticity of supply. Other goods and services can be produced by using commonly available resources that could be allocated to a wide variety of alternative tasks. Such items have a high elasticity of supply.

A Van Gogh painting is an example of a good with a vertical supply curve and a zero elasticity of supply. At the other extreme, wheat can be grown on land that is almost equally good for growing corn, so it is just as easy to grow wheat as corn. The opportunity cost of wheat in terms of forgone corn is almost constant. As a result, the supply curve of wheat is almost horizontal and its elasticity of supply is very large.

Similarly, when a good is produced in many different countries (for example, sugar and beef), the supply of the good is highly elastic.

The supply of most goods and services lies between these two extremes. The quantity produced increases by 67 percent. The elasticity of supply is equal to 67 percent divided by 4.9 percent, which equals 13.67. Because the elasticity of supply exceeds 1 (in this case by a lot), supply is elastic.

In contrast, suppose that when the price rises from $20 to $30, the quantity of pizza supplied increases from 10 to 13 per hour. The price rise is $10 and the average price is $25, so the price rises by 40 percent of the average price. The quantity increases from 10 to 13 pizzas an hour, so the increase is 3 pizzas, the average quantity is 11.5 pizzas an hour, and the quantity increases by 26 percent. The elasticity of supply is equal to 26 percent divided by 40 percent, which equals 0.65. Now, because the elasticity of supply is less than 1, supply is inelastic.

Figure 4.6 shows the range of elasticities of supply. If the quantity supplied is fixed regardless of the price, the supply curve is vertical and the elasticity of supply is zero. Supply is perfectly inelastic. This case is shown in Fig. 4.6(a). A special intermediate case occurs when the percentage change in price equals the percentage change in quantity. Supply is then unit elastic. This case is shown in Fig. 4.6(b). No matter how steep the supply curve is, if it is linear and passes through the origin, supply is unit elastic. If there is a price at which sellers are willing to offer any quantity for sale, the supply curve is horizontal and the elasticity of supply is infinite. Supply is perfectly elastic. This case is shown in Fig. 4.6(c).

FIGURE 4.6 Inelastic and Elastic Supply

Each supply illustrated here has a constant elasticity. The supply curve in part (a) illustrates the supply of a good that has a zero elasticity of supply. Each supply curve in part (b) illustrates the supply of a good with a unit elasticity of supply. All linear supply curves that pass through the origin illustrate supplies that are unit elastic. The supply curve in part (c) illustrates the supply of a good with an infinite elasticity of supply.
can be increased but only by incurring a higher cost. If a higher price is offered, the quantity supplied increases. Such goods and services have an elasticity of supply between zero and infinity.

**Time Frame for the Supply Decision** To study the influence of the amount of time elapsed since a price change, we distinguish three time frames of supply:

- Momentary supply
- Short-run supply
- Long-run supply

**Momentary Supply** When the price of a good changes, the immediate response of the quantity supplied is determined by the momentary supply of that good. Some goods, such as fruits and vegetables, have a perfectly inelastic momentary supply—a vertical supply curve. The quantities supplied depend on crop-planting decisions made earlier. In the case of oranges, for example, planting decisions have to be made many years in advance of the crop being available. Momentary supply is perfectly inelastic because, on a given day, no matter what the price of oranges, producers cannot change their output. They have picked, packed, and shipped their crop to market, and the quantity available for that day is fixed.

In contrast, some goods have a perfectly elastic momentary supply. Long-distance phone calls are an example. When many people simultaneously make a call, there is a big surge in the demand for telephone cables, computer switching, and satellite time. The quantity supplied increases, but the price remains constant. Long-distance carriers monitor fluctuations in demand and reroute calls to ensure that the quantity supplied equals the quantity demanded without changing the price.

**Short-Run Supply** The response of the quantity supplied to a price change when only some of the possible adjustments to production can be made is determined by short-run supply. Most goods have an inelastic short-run supply. To increase output in the short run, firms must work their labor force overtime and perhaps hire additional workers. To decrease their output in the short run, firms either lay off workers or reduce their hours of work. With the passage of time, firms can make more adjustments, perhaps training additional workers or buying additional tools and other equipment.

For the orange grower, if the price of oranges falls, some pickers can be laid off and oranges left on the trees to rot. Or if the price of oranges rises, the grower can use more fertilizer and improved irrigation to increase the yields of their existing trees. But an orange grower can’t change the number of trees producing oranges in the short run.

**Long-Run Supply** The response of the quantity supplied to a price change after all the technologically possible ways of adjusting supply have been exploited is determined by long-run supply. For most goods and services, long-run supply is elastic and perhaps perfectly elastic.

For the orange grower, the long run is the time it takes new tree plantings to grow to full maturity—about 15 years. In some cases, the long-run adjustment occurs only after a completely new production plant has been built and workers have been trained to operate it—typically a process that might take several years.

### REVIEW QUIZ

1. Why do we need a units-free measure of the responsiveness of the quantity supplied of a good or service to a change in its price?
2. Define the elasticity of supply and show how it is calculated.
3. What are the main influences on the elasticity of supply that make the supply of some goods elastic and the supply of other goods inelastic?
4. Provide examples of goods or services whose elasticities of supply are (a) zero, (b) greater than zero but less than infinity, and (c) infinity.
5. How does the time frame over which a supply decision is made influence the elasticity of supply? Explain your answer.

You can work these questions in Study Plan 4.3 and get instant feedback.
### Price Elasticities of Demand

<table>
<thead>
<tr>
<th>A relationship is described as</th>
<th>When its magnitude is</th>
<th>Which means that</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perfectly elastic</td>
<td>Infinity</td>
<td>The smallest possible increase in price causes an infinitely large decrease in the quantity demanded*</td>
</tr>
<tr>
<td>Elastic</td>
<td>Less than infinity</td>
<td>The percentage decrease in the quantity demanded exceeds the percentage increase in price</td>
</tr>
<tr>
<td>Unit elastic</td>
<td>1</td>
<td>The percentage decrease in the quantity demanded equals the percentage increase in price</td>
</tr>
<tr>
<td>Inelastic</td>
<td>Less than 1 but greater than zero</td>
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</tr>
<tr>
<td>Perfectly inelastic</td>
<td>Zero</td>
<td>The quantity demanded is the same at all prices</td>
</tr>
</tbody>
</table>

*In each description, the directions of change may be reversed. For example, in this case, the smallest possible decrease in price causes an infinitely large increase in the quantity demanded.

### Cross Elasticities of Demand

<table>
<thead>
<tr>
<th>A relationship is described as</th>
<th>When its value is</th>
<th>Which means that</th>
</tr>
</thead>
<tbody>
<tr>
<td>Close substitutes</td>
<td>Large</td>
<td>The smallest possible increase in the price of one good causes an infinitely large increase in the quantity* demanded of the other good</td>
</tr>
<tr>
<td>Substitutes</td>
<td>Positive</td>
<td>If the price of one good increases, the quantity demanded of the other good also increases</td>
</tr>
<tr>
<td>Unrelated goods</td>
<td>Zero</td>
<td>If the price of one good increases, the quantity demanded of the other good remains the same</td>
</tr>
<tr>
<td>Complements</td>
<td>Negative</td>
<td>If the price of one good increases, the quantity demanded of the other good decreases</td>
</tr>
</tbody>
</table>

### Income Elasticities of Demand

<table>
<thead>
<tr>
<th>A relationship is described as</th>
<th>When its value is</th>
<th>Which means that</th>
</tr>
</thead>
<tbody>
<tr>
<td>Income elastic</td>
<td>Greater than 1</td>
<td>The percentage increase in the quantity demanded is greater than the percentage increase in income*</td>
</tr>
<tr>
<td>Income inelastic</td>
<td>Less than 1 but greater than zero</td>
<td>The percentage increase in the quantity demanded is greater than zero but less than the percentage increase in income</td>
</tr>
<tr>
<td>Negative (inferior good)</td>
<td>Less than zero</td>
<td>When income increases, quantity demanded decreases</td>
</tr>
</tbody>
</table>

### Elasticities of Supply

<table>
<thead>
<tr>
<th>A relationship is described as</th>
<th>When its magnitude is</th>
<th>Which means that</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perfectly elastic</td>
<td>Infinity</td>
<td>The smallest possible increase in price causes an infinitely large increase in the quantity supplied*</td>
</tr>
<tr>
<td>Elastic</td>
<td>Less than infinity but greater than 1</td>
<td>The percentage increase in the quantity supplied exceeds the percentage increase in the price</td>
</tr>
<tr>
<td>Unit elastic</td>
<td>1</td>
<td>The percentage increase in the quantity supplied equals the percentage increase in the price</td>
</tr>
<tr>
<td>Inelastic</td>
<td>Greater than zero but less than 1</td>
<td>The percentage increase in the quantity supplied is less than the percentage increase in the price</td>
</tr>
<tr>
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<td>Zero</td>
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</tr>
</tbody>
</table>

*In each description, the directions of change may be reversed. For example, in this case, the smallest possible decrease in price causes an infinitely large increase in the quantity demanded.
ST. PETERSBURG, Fla.—A frigid Florida winter is taking its toll on your sandwich. The Sunshine State is the main U.S. source for fresh winter tomatoes, and its growers lost some 70 percent of their crop during January’s prolonged cold snap. . . .

The average wholesale price for a 25-pound box of tomatoes is now $30, up from $6.50 a year ago. Florida’s growers would normally ship about 25 million pounds of tomatoes a week; right now, they’re shipping less than a quarter of that, according to Reggie Brown of the Florida Tomato Grower’s Exchange, a tomato farmer cooperative in Maitland. . . .

And because high demand has driven up domestic prices, many wholesalers are buying from Mexico instead.

“We’re obviously losing market share to Mexico, and there’s always a price to pay to get the customer to get back into the Florida market,” Brown said.

Florida is the only place where tomatoes are grown on a large scale in the United States during winter. California doesn’t grow them until later in the year, and much of that state’s crop is used for processed foods, such as ketchup, sauce, and juice. Other states grow tomatoes in greenhouses year-round, but Florida’s winter tomato crop is by far the largest. . . .

Some Wendy’s restaurants posted signs saying tomatoes would only be provided upon request because of limited availability. . . .

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Using the information provided in this news article supplemented with an independent estimate of the price elasticity of demand, we can find the demand and supply curves in the market for winter tomatoes shown in Fig. 1.

According to J. Scott Shonkwiler and Robert D. Emerson, two agricultural economists at the University of Florida, the price elasticity of demand for winter tomatoes is 0.8.

A 1 percent rise in the price of these tomatoes brings a 0.8 percent decrease in the quantity demanded, other things remaining the same.

According to the news article, in a normal period, the price of Florida winter tomatoes is $6.50 a box (25 pounds) and growers normally ship 25 million pounds a week.

With the information just stated, we can determine the demand for winter tomatoes. It is the curve D in Figs. 1 and 2. This demand curve passes through the point that shows that 25 million pounds are demanded at a price of $6.50 a box. The elasticity of demand for winter tomatoes is 0.8.

Figure 2 shows the calculation that confirms the price elasticity of demand is 0.8. When the price rises from $6.50 to $30 a box, as it did in 2010, the quantity demanded decreases from 25 million to 8 million pounds. Use the numbers and the midpoint formula to confirm that the elasticity of demand is 0.8.

The news article says that Florida growers (the main producers of winter tomatoes) shipped less than a quarter of their normal 25 million pounds a week. So assume that they shipped 6 million pounds a week.

Other growers (using greenhouses or in Mexico) make up the difference between what the Florida growers supply and the quantity demanded.

The supply curve in 2010, S1, must pass through the equilibrium point at that time of 8 million pounds and $30 a box. It also passes through the point 6 million pounds and $6.50 a box because that is the quantity that Florida growers would ship even if the price remained at $6.50 a box.

Figure 3 zooms in on the supply curve S1. We can calculate the elasticity of supply by using the numbers in Fig. 3 and the midpoint formula. The elasticity of supply is 0.22, which means that the supply of winter tomatoes is inelastic.
Key Points

Price Elasticity of Demand (pp. 84–90)
- Elasticity is a measure of the responsiveness of the quantity demanded of a good to a change in its price, other things remaining the same.
- Price elasticity of demand equals the percentage change in the quantity demanded divided by the percentage change in the price.
- The larger the magnitude of the price elasticity of demand, the greater is the responsiveness of the quantity demanded to a given price change.
- If demand is elastic, a cut in price leads to an increase in total revenue. If demand is unit elastic, a cut in price leaves total revenue unchanged. And if demand is inelastic, a cut in price leads to a decrease in total revenue.
- Price elasticity of demand depends on how easily one good serves as a substitute for another, the proportion of income spent on the good, and the length of time elapsed since the price change.

Working Problems 1 to 8 will give you a better understanding of the price elasticity of demand.

More Elasticities of Demand (pp. 91–94)
- Income elasticity of demand measures the responsiveness of demand to a change in income, other things remaining the same. For a normal good, the income elasticity of demand is positive. For an inferior good, the income elasticity of demand is negative.
- When the income elasticity of demand is greater than 1 (income elastic), the percentage of income spent on the good increases as income increases.
- When the income elasticity of demand is less than 1 (income inelastic and inferior), the percentage of income spent on the good decreases as income increases.
- Cross elasticity of demand measures the responsiveness of the demand for one good to a change in the price of a substitute or a complement, other things remaining the same.
- The cross elasticity of demand with respect to the price of a substitute is positive. The cross elasticity of demand with respect to the price of a complement is negative.

Working Problems 9 to 16 will give you a better understanding of cross and income elasticities of demand.

Elasticity of Supply (pp. 94–96)
- Elasticity of supply measures the responsiveness of the quantity supplied of a good to a change in its price, other things remaining the same.
- The elasticity of supply is usually positive and ranges between zero (vertical supply curve) and infinity (horizontal supply curve).
- Supply decisions have three time frames: momentary, short run, and long run.
- Momentary supply refers to the response of the quantity supplied to a price change at the instant that the price changes.
- Short-run supply refers to the response of the quantity supplied to a price change after some of the technologically feasible adjustments in production have been made.
- Long-run supply refers to the response of the quantity supplied to a price change when all the technologically feasible adjustments in production have been made.

Working Problems 17 and 18 will give you a better understanding of the elasticity of supply.

Key Terms

- Cross elasticity of demand, 92
- Elastic demand, 86
- Elasticity of supply, 94
- Income elasticity of demand, 91
- Inelastic demand, 85
- Perfectly elastic demand, 85
- Perfectly inelastic demand, 85
- Price elasticity of demand, 84
- Total revenue, 88
- Total revenue test, 88
- Unit elastic demand, 85
Study Plan Problems and Applications

MyEconLab  You can work Problems 1 to 18 in MyEconLab Chapter 4 Study Plan and get instant feedback.

Price Elasticity of Demand (Study Plan 4.1)

1. Rain spoils the strawberry crop, the price rises from $4 to $6 a box, and the quantity demanded decreases from 1,000 to 600 boxes a week.
   a. Calculate the price elasticity of demand over this price range.
   b. Describe the demand for strawberries.

2. If the quantity of dental services demanded increases by 10 percent when the price of dental services falls by 10 percent, is the demand for dental services inelastic, elastic, or unit elastic?

3. The demand schedule for hotel rooms is

<table>
<thead>
<tr>
<th>Price (dollars per night)</th>
<th>Quantity demanded (millions of rooms per night)</th>
</tr>
</thead>
<tbody>
<tr>
<td>200</td>
<td>100</td>
</tr>
<tr>
<td>250</td>
<td>80</td>
</tr>
<tr>
<td>400</td>
<td>50</td>
</tr>
<tr>
<td>500</td>
<td>40</td>
</tr>
<tr>
<td>800</td>
<td>25</td>
</tr>
</tbody>
</table>

   a. What happens to total revenue when the price falls from $400 to $250 a night and from $250 to $200 a night?
   b. Is the demand for hotel rooms elastic, inelastic, or unit elastic?

4. The figure shows the demand for pens.

   Calculate the elasticity of demand when the price rises from $4 to $6 a pen. Over what price range is the demand for pens elastic?

5. In 2003, when music downloading first took off, Universal Music slashed the average price of a CD from $21 to $15. The company expected the price cut to boost the quantity of CDs sold by 30 percent, other things remaining the same.
   a. What was Universal Music’s estimate of the price elasticity of demand for CDs?
   b. If you were making the pricing decision at Universal Music, what would be your pricing decision? Explain your decision.

6. The demand for illegal drugs is inelastic. Much of the expenditure on illegal drugs comes from crime. Assuming these statements to be correct,
   a. How will a successful campaign that decreases the supply of drugs influence the price of illegal drugs and the amount spent on them?
   b. What will happen to the amount of crime?
   c. What is the most effective way of decreasing the quantity of illegal drugs bought and decreasing the amount of drug-related crime?

7. The Grip of Gas
   U.S. drivers are ranked as the least sensitive to changes in the price of gasoline. For example, if the price rose from $3 to $4 per gallon and stayed there for a year U.S. purchases of gasoline would fall only about 5 percent.
   Source: Slate, September 27, 2005

   a. Calculate the price elasticity of demand for gasoline. Is the demand for gasoline elastic, unit elastic, or inelastic?
   b. Explain how the price rise from $3 to $4 a gallon changes the total revenue from gasoline sales.

8. Spam Sales Rise as Food Costs Soar
   Sales of Spam are rising as consumers realize that Spam and other lower-cost foods can be substituted for costlier cuts of meat as a way of controlling their already stretched food budgets.

   a. Is Spam a normal good or an inferior good? Explain.
   b. Would the income elasticity of demand for Spam be negative or positive? Explain.

More Elasticities of Demand (Study Plan 4.2)

9. When Judy’s income increased from $130 to $170 a week, she increased her demand for concert tickets by 15 percent and decreased her demand for bus rides by 10 percent. Calculate Judy’s income elasticity of demand for (a) concert tickets and (b) bus rides.
10. If a 12 percent rise in the price of orange juice decreases the quantity of orange juice demanded by 22 percent and increases the quantity of apple juice demanded by 14 percent, calculate the
a. Price elasticity of demand for orange juice.
b. Cross elasticity of demand for orange juice with respect to the price of orange juice.

11. If a 5 percent rise in the price of sushi increases the quantity of soy sauce demanded by 2 percent and decreases the quantity of sushi demanded by 1 percent, calculate the
a. Price elasticity of demand for sushi.
b. Cross elasticity of demand for soy sauce with respect to the price of sushi.

12. **Swelling Textbook Costs Have College Students Saying “Pass”**
   Textbook prices have doubled and risen faster than average prices for the past two decades. Sixty percent of students do not buy textbooks. Some students hunt for used copies and sell them back at the end of the semester; some buy online, which is often cheaper than the campus store; some use the library copy and wait till it’s free; some share the book with a classmate.
   

   Explain what this news clip implies about
   a. The price elasticity of demand for college textbooks.
   b. The income elasticity of demand for college textbooks.
   c. The cross elasticity of demand for college textbooks from the campus bookstore with respect to the online price of a textbook.

Use the following information to work Problems 13 to 15.

**As Gas Costs Soar, Buyers Flock to Small Cars**
Faced with high gas prices, Americans are substituting smaller cars for SUVs. In April 2008, Toyota Yaris sales increased 46 percent and Ford Focus sales increased 32 percent from a year earlier. SUV sales decreased 25 percent in 2008 and Chevrolet Tahoe sales fell 35 percent. Full-size pickup sales decreased 15 percent in 2008 and Ford F-Series pickup sales decreased by 27 percent in April 2008. The effect of a downsized vehicle fleet on fuel consumption is unknown. In California in January 2008, gasoline consumption was 4 percent lower and the price of gasoline 30 percent higher than in January 2007.
   

13. Calculate the price elasticity of demand for gasoline in California.

14. Calculate the cross elasticity of demand for
   a. Toyota Yaris with respect to the price of gasoline.
   b. Ford Focus with respect to the price of gasoline.

15. Calculate the cross elasticity of demand for
   a. Chevrolet Tahoe with respect to the price of gasoline.
   b. A full-size pickup with respect to the price of gasoline.

16. **Home Depot Earnings Hammered**
As gas and food prices increased and home prices slumped, people had less extra income to spend on home improvements. And the improvements that they made were on small inexpensive types of repairs and not major big-ticket items.

   Source: CNN, May 20, 2008

   a. What does this news clip imply about the income elasticity of demand for big-ticket home-improvement items?
   b. Would the income elasticity of demand be greater or less than 1? Explain.

**Elasticity of Supply** (Study Plan 4.3)

17. The table sets out the supply schedule of jeans.

<table>
<thead>
<tr>
<th>Price (dollars per pair)</th>
<th>Quantity supplied (millions of pairs per year)</th>
</tr>
</thead>
<tbody>
<tr>
<td>120</td>
<td>24</td>
</tr>
<tr>
<td>125</td>
<td>28</td>
</tr>
<tr>
<td>130</td>
<td>32</td>
</tr>
<tr>
<td>135</td>
<td>36</td>
</tr>
</tbody>
</table>

   Calculate the elasticity of supply when
   a. The price rises from $125 to $135 a pair.
   b. The average price is $125 a pair.

18. **Study Ranks Honolulu Third Highest for “Unaffordable Housing”**
A study ranks Honolulu number 3 in the world for the most unaffordable housing market in urban locations, behind Los Angeles and San Diego and is deemed “severely unaffordable.” With significant constraints on the supply of land for residential development, housing inflation has resulted.


   a. Would the supply of housing in Honolulu be elastic or inelastic?
   b. Explain how the elasticity of supply plays an important role in influencing how rapidly housing prices in Honolulu rise.
24. Your price elasticity of demand for bananas is 4. If the price of bananas rises by 5 percent, what is
   a. The percentage change in the quantity of bananas you buy?
   b. The change in your expenditure on bananas?

25. As Gasoline Prices Soar, Americans Slowly Adapt
   As gas prices rose in March 2008, Americans drove 11 billion fewer miles than in March 2007. Realizing that prices are not going down, Americans are adapting to higher energy costs. Americans spend 3.7 percent of their disposable income on transportation fuels. How much we spend on gasoline depends on the choices we make: what car we drive, where we live, how much time we spend driving, and where we choose to go. For many people, higher energy costs mean fewer restaurant meals, deferred weekend outings with the kids, less air travel, and more time closer to home.

   Source: International Herald Tribune, May 23, 2008

   a. List and explain the elasticities of demand that are implicitly referred to in the news clip.
   b. Why, according to the news clip, is the demand for gasoline inelastic?

26. Given the prices of the two holidays, is the income elasticity of demand for exotic holidays positive or negative? Are exotic holidays a normal good or an inferior good? Are local holidays a normal good or an inferior good?
27. Are exotic holidays and local holidays substitutes? Explain your answer.
28. When Alex's income was $3,000, he bought 4 bagels and 12 donuts a month. Now his income is $5,000 and he buys 8 bagels and 6 donuts a month.
Calculate Alex’s income elasticity of demand for
a. Bagels.
b. Donuts.

29. Wal-Mart’s Recession-Time Pet Project
During the recession, Wal-Mart moved its pet food and supplies to in front of its other fast-growing business, baby products. Retail experts point out that kids and pets tend to be fairly recession-resistant businesses—even in a recession, dogs will be fed and kids will get their toys.

Source: CNN, May 13, 2008

a. What does this news clip imply about the income elasticity of demand for pet food and baby products?
b. Would the income elasticity of demand be greater or less than 1? Explain.

30. If a 5 percent fall in the price of chocolate sauce increases the quantity of chocolate sauce demanded by 10 percent and increases the quantity of ice cream demanded by 15 percent, calculate the
a. Price elasticity of demand for chocolate sauce.
b. Cross elasticity of demand for ice cream with respect to the price of chocolate sauce.

31. Netflix to Offer Online Movie Viewing
Online movie rental service Netflix has introduced a new feature to allow customers to watch movies and television series on their personal computers. Netflix competes with video rental retailer Blockbuster, which added an online rental service to the in-store rental service.

Source: CNN, January 16, 2007

a. How will online movie viewing influence the price elasticity of demand for in-store movie rentals?
b. Would the cross elasticity of demand for online movies and in-store movie rentals be negative or positive? Explain.
c. Would the cross elasticity of demand for online movies with respect to high-speed Internet service be negative or positive? Explain.

32. To Love, Honor, and Save Money
In a survey of caterers and event planners, nearly half of them said that they were seeing declines in wedding spending in response to the economic slowdown; 12% even reported wedding cancellations because of financial concerns.

Source: Time, June 2, 2008

a. Based upon this news clip, are wedding events a normal good or inferior good? Explain.
b. Are wedding events more a necessity or a luxury? Would the income elasticity of demand be greater than 1, less than 1, or equal to 1? Explain.

Elasticity of Supply

33. The supply schedule of long-distance phone calls is

<table>
<thead>
<tr>
<th>Price (cents per minute)</th>
<th>Quantity supplied (millions of minutes per day)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>200</td>
</tr>
<tr>
<td>20</td>
<td>400</td>
</tr>
<tr>
<td>30</td>
<td>600</td>
</tr>
<tr>
<td>40</td>
<td>800</td>
</tr>
</tbody>
</table>

Calculate the elasticity of supply when
a. The price falls from 40¢ to 30¢ a minute.
b. The average price is 20¢ a minute.

34. Weak Coal Prices Hit China’s Third-Largest Coal Miner
The chairman of Yanzhou Coal Mining reported that the recession had decreased the demand for coal, with its sales falling by 11.9 percent to 7.92 million tons from 8.99 million tons a year earlier, despite a 10.6 percent cut in the price.

Source: Dow Jones, April 27, 2009

Calculate the price elasticity of supply of coal. Is the supply of coal elastic or inelastic?

Economics in the News

35. After you have studied Reading Between the Lines on pp. 98–99, answer the following questions.

a. Which demand is more price elastic and why: tomatoes in general or Florida winter tomatoes?
b. When cold weather destroyed the Florida crop and more tomatoes came from Mexico and greenhouses, what happened to the supply of tomatoes and the quantity of tomatoes supplied?
c. The news article says the “high demand has driven up prices” and “wholesalers are buying from Mexico.” What does this statement mean? Did demand increase? Did it decrease? Is the news article correct?
d. Reggie Brown says “We’re obviously losing market share to Mexico, and there’s always a price to pay to get the customer to get back into the Florida market.” What does he mean and what does that imply about the elasticity of demand for Florida tomatoes when the price rises and when the price falls?
When you order a pizza, your self-interested choice influences how resources are used. A market coordinates your choice with the self-interested choices of a pizza cook and a delivery person to fill your order. Do markets allocate resources between pizza and everything else efficiently?

Markets generate huge income inequality: You can afford to buy a pizza but it might be an unaffordable luxury for a very poor person. Is this situation fair?

You’re now going to learn how economists approach these questions. At the end of the chapter, in Reading Between the Lines, you will apply what you’ve learned to see how congestion pricing could end the rush-hour crawl and make our road use efficient.
Resource Allocation Methods

Resources are scarce, so they must be allocated somehow. The goal of this chapter is to evaluate the ability of markets to allocate resources efficiently and fairly. But to see whether the market does a good job, we must compare it with its alternatives. What are the alternative methods of allocating scarce resources?

Eight alternative methods might be used. They are

- Market price
- Command
- Majority rule
- Contest
- First-come, first-served
- Lottery
- Personal characteristics
- Force

Let’s briefly examine each method.

Market Price

When a market price allocates a scarce resource, the people who are willing and able to pay that price get the resource. Two kinds of people decide not to pay the market price: those who can afford to pay but choose not to buy and those who are too poor and simply can’t afford to buy.

For many goods and services, distinguishing between those who choose not to buy and those who can’t afford to buy doesn’t matter. But for a few items, it does matter. For example, poor people can’t afford to pay school fees and doctors’ fees. Because poor people can’t afford items that most people consider to be essential, these items are usually allocated by one of the other methods.

Command

A command system allocates resources by the order (command) of someone in authority. In the U.S. economy, the command system is used extensively inside firms and government departments. For example, if you have a job, most likely someone tells you what to do. Your labor is allocated to specific tasks by a command.

A command system works well in organizations in which the lines of authority and responsibility are clear and it is easy to monitor the activities being performed. But a command system works badly when the range of activities to be monitored is large and when it is easy for people to fool those in authority. North Korea uses a command system and it works so badly that it even fails to deliver an adequate supply of food.

Majority Rule

Majority rule allocates resources in the way that a majority of voters choose. Societies use majority rule to elect representative governments that make some of the biggest decisions. For example, majority rule decides the tax rates that end up allocating scarce resources between private use and public use. And majority rule decides how tax dollars are allocated among competing uses such as education and health care.

Majority rule works well when the decisions being made affect large numbers of people and self-interest must be suppressed to use resources most effectively.

Contest

A contest allocates resources to a winner (or a group of winners). Sporting events use this method. Andy Roddick competes with other tennis professionals, and the winner gets the biggest payoff. But contests are more general than those in a sports arena, though we don’t normally call them contests. For example, Bill Gates won a contest to provide the world’s personal computer operating system.

Contests do a good job when the efforts of the “players” are hard to monitor and reward directly. When a manager offers everyone in the company the opportunity to win a big prize, people are motivated to work hard and try to become the winner. Only a few people end up with a big prize, but many people work harder in the process of trying to win. The total output produced by the workers is much greater than it would be without the contest.

First-Come, First-Served

A first-come, first-served method allocates resources to those who are first in line. Many casual restaurants won’t accept reservations. They use first-come, first-served to allocate their scarce tables. Highway space is allocated in this way too: The first to arrive at the on-ramp gets the road space. If too many
vehicles enter the highway, the speed slows and people wait in line for some space to become available.

First-come, first-served works best when, as in the above examples, a scarce resource can serve just one user at a time in a sequence. By serving the user who arrives first, this method minimizes the time spent waiting for the resource to become free.

**Lottery**

Lotteries allocate resources to those who pick the winning number, draw the lucky cards, or come up lucky on some other gaming system. State lotteries and casinos reallocate millions of dollars worth of goods and services every year.

But lotteries are more widespread than jackpots and roulette wheels in casinos. They are used to allocate landing slots to airlines at some airports, places in the New York and Boston marathons, and have been used to allocate fishing rights and the electromagnetic spectrum used by cell phones.

Lotteries work best when there is no effective way to distinguish among potential users of a scarce resource.

**Personal Characteristics**

When resources are allocated on the basis of personal characteristics, people with the “right” characteristics get the resources. Some of the resources that matter most to you are allocated in this way. For example, you will choose a marriage partner on the basis of personal characteristics. But this method can also be used in unacceptable ways. Allocating the best jobs to white, Anglo-Saxon males and discriminating against visible minorities and women is an example.

**Force**

Force plays a crucial role, for both good and ill, in allocating scarce resources. Let’s start with the ill.

War, the use of military force by one nation against another, has played an enormous role historically in allocating resources. The economic supremacy of European settlers in the Americas and Australia owes much to the use of this method.

Theft, the taking of the property of others without their consent, also plays a large role. Both large-scale organized crime and small-scale petty crime collectively allocate billions of dollars worth of resources annually.

But force plays a crucial positive role in allocating resources. It provides the state with an effective method of transferring wealth from the rich to the poor, and it provides the legal framework in which voluntary exchange in markets takes place.

A legal system is the foundation on which our market economy functions. Without courts to enforce contracts, it would not be possible to do business. But the courts could not enforce contracts without the ability to apply force if necessary. The state provides the ultimate force that enables the courts to do their work.

More broadly, the force of the state is essential to uphold the principle of the rule of law. This principle is the bedrock of civilized economic (and social and political) life. With the rule of law upheld, people can go about their daily economic lives with the assurance that their property will be protected—that they can sue for violations against their property (and be sued if they violate the property of others).

Free from the burden of protecting their property and confident in the knowledge that those with whom they trade will honor their agreements, people can get on with focusing on the activity in which they have a comparative advantage and trading for mutual gain.
**Benefit, Cost, and Surplus**

Resources are allocated efficiently and in the *social interest* when they are used in the ways that people value most highly. You saw in Chapter 2 that this outcome occurs when the quantities produced are at the point on the *PPF* at which marginal benefit equals marginal cost (see pp. 35–37). We’re now going to see whether competitive markets produce the efficient quantities.

We begin on the demand side of a market.

**Demand, Willingness to Pay, and Value**

In everyday life, we talk about “getting value for money.” When we use this expression, we are distinguishing between *value* and *price*. Value is what we get, and price is what we pay.

The value of one more unit of a good or service is its marginal benefit. We measure marginal benefit by the maximum price that is willingly paid for another unit of the good or service. But willingness to pay determines demand. A demand curve is a marginal benefit curve.

In Fig. 5.1(a), Lisa is willing to pay $1 for the 30th slice of pizza and $1 is her marginal benefit from that slice. In Fig. 5.1(b), Nick is willing to pay $1 for the 10th slice of pizza and $1 is his marginal benefit from that slice. But at what quantity is the market willing to pay $1 for the marginal slice? The answer is provided by the *market demand curve*.

### Individual Demand and Market Demand

The relationship between the price of a good and the quantity demanded by one person is called *individual demand*. And the relationship between the price of a good and the quantity demanded by all buyers is called *market demand*.

The market demand curve is the horizontal sum of the individual demand curves and is formed by adding the quantities demanded by all the individuals at each price.

**FIGURE 5.1 Individual Demand, Market Demand, and Marginal Social Benefit**

At a price of $1 a slice, the quantity demanded by Lisa is 30 slices and the quantity demanded by Nick is 10 slices, so the quantity demanded by the market is 40 slices. Lisa’s demand curve in part (a) and Nick’s demand curve in part (b) sum horizontally to the market demand curve in part (c). The market demand curve is the marginal social benefit (*MSB*) curve.
At a price of $1 a slice, Lisa demands 30 slices and Nick demands 10 slices, so the market quantity demanded at $1 a slice is 40 slices.

For Lisa and Nick, their demand curves are their marginal benefit curves. For society, the market demand curve is the marginal benefit curve. We call the marginal benefit to the entire society marginal social benefit. So the market demand curve is also the marginal social benefit (MSB) curve.

**Consumer Surplus**

We don’t always have to pay as much as we are willing to pay. We get a bargain. When people buy something for less than it is worth to them, they receive a consumer surplus. **Consumer surplus** is the excess of the benefit received from a good over the amount paid for it. We can calculate consumer surplus as the marginal benefit (or value) of a good minus its price, summed over the quantity bought.

Figure 5.2(a) shows Lisa’s consumer surplus from pizza when the price is $1 a slice. At this price, she buys 30 slices a month because the 30th slice is worth exactly $1 to her. But Lisa is willing to pay $2 for the 10th slice, so her marginal benefit from this slice is $1 more than she pays for it—she receives a surplus of $1 on the 10th slice.

Lisa’s consumer surplus is the sum of the surpluses on all of the slices she buys. This sum is the area of the green triangle—the area below the demand curve and above the market price line. The area of this triangle is equal to its base (30 slices) multiplied by its height ($1.50) divided by 2, which is $22.50. The area of the blue rectangle in Fig. 5.2(a) shows what Lisa pays for 30 slices of pizza.

Figure 5.2(b) shows Nick’s consumer surplus, and part (c) shows the consumer surplus for the market. The consumer surplus for the market is the sum of the consumer surpluses of Lisa and Nick.

All goods and services have decreasing marginal benefit, so people receive more benefit from their consumption than the amount they pay.

**Supply and Marginal Cost**

Your next task is to see how market supply reflects marginal cost. The connection between supply and cost closely parallels the related ideas about demand and benefit that you’ve just studied. Firms are in business to make a profit. To do so, they must sell...
their output for a price that exceeds the cost of production. Let’s investigate the relationship between cost and price.

**Supply, Cost, and Minimum Supply-Price**

Firms make a profit when they receive more from the sale of a good or service than the cost of producing it. Just as consumers distinguish between value and price, so producers distinguish between cost and price. Cost is what a firm gives up when it produces a good or service and price is what a firm receives when it sells the good or service.

The cost of producing one more unit of a good or service is its marginal cost. Marginal cost is the minimum price that producers must receive to induce them to offer one more unit of a good or service for sale. But the minimum supply-price determines supply. A supply curve is a marginal cost curve.

In Fig. 5.3(a), Maria is willing to produce the 100th pizza for $15, her marginal cost of that pizza. In Fig. 5.3(b), Max is willing to produce the 50th pizza for $15, his marginal cost.

What quantity is this market willing to produce for $15 a pizza? The answer is provided by the market supply curve.

**Individual Supply and Market Supply**

The relationship between the price of a good and the quantity supplied by one producer is called *individual supply*. And the relationship between the price of a good and the quantity supplied by all producers is called *market supply*.

The market supply curve is the horizontal sum of the individual supply curves and is formed by adding the quantities supplied by all the producers at each price.

Figure 5.3(c) illustrates the market supply of pizzas if Maria and Max are the only producers. Maria’s supply curve in part (a) and Max’s supply curve in part (b) sum horizontally to the market supply curve in part (c).

At a price of $15 a pizza, Maria supplies 100 pizzas and Max supplies 50 pizzas, so the quantity supplied by the market is $150 pizzas.

For Maria and Max, their supply curves are their marginal cost curves. For society, the market supply curve is its marginal cost curve. We call the society’s marginal cost *marginal social cost* or *MSC*. So the market supply curve is also the *marginal social cost* (MSC) curve.

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**FIGURE 5.3** Individual Supply, Market Supply, and Marginal Social Cost

<table>
<thead>
<tr>
<th>(a) Maria’s supply</th>
<th>(b) Max’s supply</th>
<th>(c) Market supply</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1.png" alt="Graph" /></td>
<td><img src="image2.png" alt="Graph" /></td>
<td><img src="image3.png" alt="Graph" /></td>
</tr>
</tbody>
</table>

At a price of $15 a pizza, the quantity supplied by Maria is 100 pizzas and the quantity supplied by Max is 50 pizzas, so the quantity supplied by the market is 150 pizzas. Maria’s supply curve in part (a) and Max’s supply curve in part (b) sum horizontally to the market supply curve in part (c). The market supply curve is the marginal social cost (MSC) curve.
Benefit, Cost, and Surplus

Producers Surplus

When price exceeds marginal cost, the firm receives a producer surplus. Producer surplus is the excess of the amount received from the sale of a good or service over the cost of producing it. We calculate producer surplus as the price received minus the marginal cost (or minimum supply-price), summed over the quantity sold.

Figure 5.4(a) shows Maria’s producer surplus from pizza when the price is $15 a pizza. At this price, she sells 100 pizzas a month because the 100th pizza costs her $15 to produce. But Maria is willing to produce the 50th pizza for her marginal cost, which is $10, so she receives a surplus of $5 on this pizza.

Maria’s producer surplus is the sum of the surpluses on the pizzas she sells. This sum is the area of the blue triangle—the area below the market price and above the supply curve. The area of this triangle is equal to its base (100) multiplied by its height ($10) divided by 2, which is $500.

The red area below the supply curve in Fig. 5.4(a) shows what it costs Maria to produce 100 pizzas.

The area of the blue triangle in Fig. 5.4(b) shows Max’s producer surplus and the blue area in Fig. 5.4(c) shows the producer surplus for the market.

The producer surplus for the market is the sum of the producer surpluses of Maria and Max.

Consumer surplus and producer surplus can be used to measure the efficiency of a market. Let’s see how we can use these concepts to study the efficiency of a competitive market.

REVIEW QUIZ

1. What is the relationship between the marginal benefit, value, and demand?
2. What is the relationship between individual demand and market demand?
3. What is consumer surplus? How is it measured?
4. What is the relationship between the marginal cost, minimum supply-price, and supply?
5. What is the relationship between individual supply and market supply?
6. What is producer surplus? How is it measured?

You can work these questions in Study Plan 5.2 and get instant feedback. MyEconLab

FIGURE 5.4 Supply and Producer Surplus

Maria is willing to produce the 50th pizza for $10 in part (a). At a market price of $15 a pizza, Maria gets a surplus of $5 on the 50th pizza. The blue triangle shows her producer surplus on the 100 pizzas she sells at $15 each.

The blue triangle in part (b) shows Max’s producer surplus on the 50 pizzas that he sells at $15 each. The blue area in part (c) shows producer surplus for the market. The red areas show the cost of producing the pizzas sold.
Is the Competitive Market Efficient?

Figure 5.5(a) shows the market for pizza. The market forces that you studied in Chapter 3 (pp. 66–67) pull the pizza market to its equilibrium price of $15 a pizza and equilibrium quantity of 10,000 pizzas a day. Buyers enjoy a consumer surplus (green area) and sellers enjoy a producer surplus (blue area), but is this competitive equilibrium efficient?

Efficiency of Competitive Equilibrium

You’ve seen that the market demand curve for a good or service tells us the marginal social benefit from it. You’ve also seen that the market supply curve of a good or service tells us the marginal social cost of producing it.

Equilibrium in a competitive market occurs when the quantity demanded equals the quantity supplied at the intersection of the demand curve and the supply curve. At this intersection point, marginal social benefit on the demand curve equals marginal social cost on the supply curve. This equality is the condition for allocative efficiency. So in equilibrium, a competitive market achieves allocative efficiency.

Figure 5.5 illustrates the efficiency of competitive equilibrium. The demand curve and the supply curve intersect in part (a) and marginal social benefit equals marginal social cost in part (b).

If production is less than 10,000 pizzas a day, the marginal pizza is valued more highly than it costs to produce. If production exceeds 10,000 pizzas a day, the marginal pizza costs more to produce than the value that consumers place on it. Only when 10,000 pizzas a day are produced is the marginal pizza worth exactly what it costs.

The competitive market pushes the quantity of pizzas produced to its efficient level of 10,000 a day. If production is less than 10,000 pizzas a day, a shortage raises the price, which increases production. If production exceeds 10,000 pizzas a day, a surplus of pizzas lowers the price, which decreases production. So a competitive pizza market is efficient.

Figure 5.5(a) also shows the consumer surplus and producer surplus. The sum of consumer surplus and producer surplus is called total surplus. When the efficient quantity is produced, total surplus is maximized. Buyers and sellers acting in their self-interest end up promoting the social interest.
Economics in Action
Seeing the Invisible Hand

Adam Smith said that each participant in a competitive market is “led by an invisible hand to promote an end [the efficient use of resources] which was no part of his intention” (see p. 8). Smith believed that the invisible hand sends resources to the uses in which they have the highest value.

You can’t see an invisible hand, but you can imagine one, and you can see its consequences in the cartoon and in today’s world.

Umbrella for Sale The cold drinks vendor has cold drinks and shade and he has a marginal cost and a minimum supply-price of each. The reader on the park bench has a marginal benefit and willingness to pay for each. The reader’s marginal benefit from shade exceeds the vendor’s marginal cost; but the vendor’s marginal cost of a cold drink exceeds the reader’s marginal benefit. They trade the umbrella. The vendor gets a producer surplus from selling the shade for more than its marginal cost, and the reader gets a consumer surplus from buying the shade for less than its marginal benefit. Both are better off and the umbrella has moved to its highest-valued use.

The Invisible Hand at Work Today The market economy relentlessly performs the activity illustrated in the cartoon to achieve an efficient allocation of resources.

Suppose that a Florida frost cuts the supply of tomatoes. With fewer tomatoes available, the marginal social benefit increases. A shortage of tomatoes raises their price, so the market allocates the quantity available to the people who value them most highly.

If a new technology cuts the cost of producing a smart phone, the supply of smart phones increases and the price of a smart phone falls. The lower price encourages an increase in the quantity demanded of this now less-costly tool. The marginal social benefit from a smart phone is brought to equality with its lower marginal social cost.

Market Failure Markets do not always achieve an efficient outcome. We call a situation in which a market delivers an inefficient outcome one of market failure. Market failure can occur because too little of an item is produced (underproduction) or too much is produced (overproduction). We’ll describe these two market failure outcomes and then see why they arise.

Underproduction In Fig. 5.6(a), the quantity of pizzas produced is 5,000 a day. At this quantity, consumers are willing to pay $20 for a pizza that costs only $10 to produce. By producing only 5,000 pizzas a day, total surplus is smaller than its maximum possible level. The quantity produced is inefficient—there is underproduction.

We measure the scale of inefficiency by deadweight loss, which is the decrease in total surplus that results
from an inefficient level of production. The gray triangle in Fig. 5.6(a) shows the deadweight loss.

**Overproduction** In Fig. 5.6(b), the quantity of pizzas produced is 15,000 a day. At this quantity, consumers are willing to pay only $10 for a pizza that costs $20 to produce. By producing the 15,000th pizza, $10 of resources are wasted. Again, the gray triangle shows the deadweight loss, which reduces the total surplus to less than its maximum.

**Sources of Market Failure**

Obstacles to efficiency that bring market failure and create deadweight losses are:

- Price and quantity regulations
- Taxes and subsidies
- Externalities
- Public goods and common resources
- Monopoly
- High transactions costs

**Price and Quantity Regulations** Price regulations that put a cap on the rent a landlord is permitted to charge and laws that require employers to pay a minimum wage sometimes block the price adjustments that balance the quantity demanded and the quantity supplied and lead to underproduction. Quantity regulations that limit the amount that a farm is permitted to produce also lead to underproduction.

**Taxes and Subsidies** Taxes increase the prices paid by buyers and lower the prices received by sellers. So taxes decrease the quantity produced and lead to underproduction. Subsidies, which are payments by the government to producers, decrease the prices paid by buyers and increase the prices received by sellers. So subsidies increase the quantity produced and lead to overproduction.

**Externalities** An externality is a cost or a benefit that affects someone other than the seller or the buyer. An external cost arises when an electric utility burns coal and emits carbon dioxide. The utility doesn’t consider the cost of climate change when it decides how much power to produce. The result is overproduction. An external benefit arises when an apartment owner installs a smoke detector and decreases her...
neighbor’s fire risk. She doesn’t consider the benefit to her neighbor when she decides how many detectors to install. The result is underproduction.

Public Goods and Common Resources A public good is a good or service that is consumed simultaneously by everyone even if they don’t pay for it. National defense is an example. Competitive markets would underproduce national defense because it is in each person’s interest to free ride on everyone else and avoid paying for her or his share of such a good.

A common resource is owned by no one but is available to be used by everyone. Atlantic salmon is an example. It is in everyone’s self-interest to ignore the costs they impose on others when they decide how much of a common resource to use. The result is that the resource is overused.

Monopoly A monopoly is a firm that is the sole provider of a good or service. Local water supply and cable television are supplied by firms that are monopolies. The monopoly’s self-interest is to maximize its profit. Because the monopoly has no competitors, it can set the price to achieve its self-interested goal. To achieve its goal, a monopoly produces too little and charges too high a price. It leads to underproduction.

High Transactions Costs When you go to Starbucks, you pay for more than the coffee. You pay your share of the cost of the barrista’s time, the espresso maker, and the decor. When you buy your first apartment, you will pay for more than the apartment. You will buy the services of an agent and a lawyer. Economists call the costs of the services that enable a market to bring buyers and sellers together transactions costs.

It is costly to operate any market so to use market price to allocate resources, it must be worth bearing the transactions costs. Some markets are too costly to operate. For example, it is too costly to operate a market in time slots on a local tennis court. Instead of a market, the court uses first-come, first-served: You hang around until the court becomes vacant and “pay” with your waiting time. When transactions costs are high, the market might underproduce.

You now know the conditions under which resource allocation is efficient. You’ve seen how a competitive market can be efficient, and you’ve seen some obstacles to efficiency. Can alternative allocation methods improve on the market?

Alternatives to the Market

When a market is inefficient, can one of the alternative nonmarket methods that we described at the beginning of this chapter do a better job? Sometimes it can.

Often, majority rule might be used in an attempt to improve the allocation of resources. But majority rule has its own shortcomings. A group that pursues the self-interest of its members can become the majority. For example, a price or quantity regulation that creates inefficiency is almost always the result of a self-interested group becoming the majority and imposing costs on the minority. Also, with majority rule, votes must be translated into actions by bureaucrats who have their own agendas based on their self-interest.

Managers in firms issue commands and avoid the transactions costs that they would incur if they went to a market every time they needed a job done.

First-come, first-served works best in some situations. Think about the scene at a busy ATM. Instead of waiting in line people might trade places at a “market” price. But someone would need to ensure that trades were honored. At a busy ATM, first-come, first-served is the most efficient arrangement.

There is no one efficient mechanism that allocates all resources efficiently. But markets, when supplemented by other mechanisms such as majority rule, command systems, and first-come, first-served, do an amazingly good job.

REVIEW QUIZ

1. Do competitive markets use resources efficiently? Explain why or why not.
2. What is deadweight loss and under what conditions does it occur?
3. What are the obstacles to achieving an efficient allocation of resources in the market economy?

You can work these questions in Study Plan 5.3 and get instant feedback. MyEconLab

Is an efficient allocation of resources also a fair allocation? Does the competitive market provide people with fair incomes for their work? Do people always pay a fair price for the things they buy? Don’t we need the government to step into some competitive markets to prevent the price from rising too high or falling too low? Let’s now study these questions.
Is the Competitive Market Fair?

When a natural disaster strikes, such as a severe winter storm or a hurricane, the prices of many essential items jump. The reason prices jump is that the demand and willingness to pay for these items has increased, but the supply has not changed. So the higher prices achieve an efficient allocation of scarce resources. News reports of these price hikes almost never talk about efficiency. Instead, they talk about equity or fairness. The claim that is often made is that it is unfair for profit-seeking dealers to cheat the victims of natural disaster.

Similarly, when low-skilled people work for a wage that is below what most would regard as a “living wage,” the media and politicians talk of employers taking unfair advantage of their workers.

How do we decide whether something is fair or unfair? You know when you think something is unfair, but how do you know? What are the principles of fairness?

Philosophers have tried for centuries to answer this question. Economists have offered their answers too. But before we look at the proposed answers, you should know that there is no universally agreed upon answer.

Economists agree about efficiency. That is, they agree that it makes sense to make the economic pie as large as possible and to produce it at the lowest possible cost. But they do not agree about equity. That is, they do not agree about what are fair shares of the economic pie for all the people who make it. The reason is that ideas about fairness are not exclusively economic ideas. They touch on politics, ethics, and religion. Nevertheless, economists have thought about these issues and have a contribution to make. Let’s examine the views of economists on this topic.

To think about fairness, think of economic life as a game—a serious game. All ideas about fairness can be divided into two broad groups. They are:

- It’s not fair if the result isn’t fair.
- It’s not fair if the rules aren’t fair.

It’s Not Fair If the Result Isn’t Fair

The earliest efforts to establish a principle of fairness were based on the view that the result is what matters. The general idea was that it is unfair if people’s incomes are too unequal. For example, it is unfair that a bank president earns millions of dollars a year while a bank teller earns only thousands of dollars. It is unfair that a store owner makes a larger profit and her customers pay higher prices in the aftermath of a winter storm.

During the nineteenth century, economists thought they had made an incredible discovery: Efficiency requires equality of incomes. To make the economic pie as large as possible, it must be cut into equal pieces, one for each person. This idea turns out to be wrong. But there is a lesson in the reason that it is wrong, so this idea is worth a closer look.

Utilitarianism The nineteenth-century idea that only equality brings efficiency is called utilitarianism. Utilitarianism is a principle that states that we should strive to achieve “the greatest happiness for the greatest number.” The people who developed this idea were known as utilitarians. They included the most eminent thinkers, such as Jeremy Bentham and John Stuart Mill.

Utilitarians argued that to achieve “the greatest happiness for the greatest number,” income must be transferred from the rich to the poor up to the point of complete equality—to the point at which there are no rich and no poor.

They reasoned in the following way: First, everyone has the same basic wants and a similar capacity to enjoy life. Second, the greater a person’s income, the smaller is the marginal benefit of a dollar. The millionth dollar spent by a rich person brings a smaller marginal benefit to that person than the marginal benefit that the thousandth dollar spent brings to a poorer person. So by transferring a dollar from the millionaire to the poorer person, more is gained than is lost. The two people added together are better off.

Figure 5.7 illustrates this utilitarian idea. Tom and Jerry have the same marginal benefit curve, MB.

(Marginal benefit is measured on the same scale of 1 to 3 for both Tom and Jerry.) Tom is at point A. He earns $5,000 a year, and his marginal benefit from a dollar is 3 units. Jerry is at point B. He earns $45,000 a year, and his marginal benefit from a dollar is 1 unit. If a dollar is transferred from Jerry to Tom, Jerry loses 1 unit of marginal benefit and Tom gains 3 units. So together, Tom and Jerry are better off—they are sharing the economic pie more efficiently. If a second dollar is transferred, the same thing happens: Tom gains more than Jerry loses. And the same is true for every dollar transferred until they both reach point C. At point C, Tom and Jerry have $25,000.
The tradeoff is between the size of the economic pie and the degree of equality with which it is shared. The greater the amount of income redistribution through income taxes, the greater is the inefficiency—the smaller is the economic pie.

There is a second source of inefficiency. A dollar taken from a rich person does not end up as a dollar in the hands of a poorer person. Some of the dollar is spent on administration of the tax and transfer system. The cost of tax-collecting agencies, such as the Internal Revenue Service (IRS), and welfare-administering agencies, such as the Centers for Medicare and Medicaid, must be paid with some of the taxes collected. Also, taxpayers hire accountants, auditors, and lawyers to help them ensure that they pay the correct amount of taxes. These activities use skilled labor and capital resources that could otherwise be used to produce goods and services that people value.

When all these costs are taken into account, taking a dollar from a rich person does not give a dollar to a poor person. It is possible that with high taxes, people with low incomes might end up being worse off. Suppose, for example, that highly taxed entrepreneurs decide to work less hard and shut down some of their businesses. Low-income workers get fired and must seek other, perhaps even lower-paid, work.

Today, because of the big tradeoff, no one says that fairness requires complete equality of incomes.

### Make the Poorest as Well Off as Possible

A new solution to the big-tradeoff problem was proposed by philosopher John Rawls in a classic book entitled *A Theory of Justice*, published in 1971. Rawls says that, taking all the costs of income transfers into account, the fair distribution of the economic pie is the one that makes the poorest person as well off as possible. The incomes of rich people should be taxed, and after paying the costs of administering the tax and transfer system, what is left should be transferred to the poor. But the taxes must not be so high that they make the economic pie shrink to the point at which the poorest person ends up with a smaller piece. A bigger share of a smaller pie can be less than a smaller share of a bigger pie. The goal is to make the piece enjoyed by the poorest person as big as possible. Most likely, this piece will not be an equal share.

The “fair results” idea requires a change in the results after the game is over. Some economists say that these changes are themselves unfair and propose a different way of thinking about fairness.
It’s Not Fair If the Rules Aren’t Fair

The idea that it’s not fair if the rules aren’t fair is based on a fundamental principle that seems to be hardwired into the human brain: the symmetry principle. The symmetry principle is the requirement that people in similar situations be treated similarly. It is the moral principle that lies at the center of all the big religions and that says, in some form or other, “Behave toward other people in the way you expect them to behave toward you.”


Nozick argues that the idea of fairness as an outcome or result cannot work and that fairness must be based on the fairness of the rules. He suggests that fairness obeys two rules:

1. The state must enforce laws that establish and protect private property.
2. Private property may be transferred from one person to another only by voluntary exchange.

The first rule says that everything that is valuable must be owned by individuals and that the state must ensure that theft is prevented. The second rule says that the only legitimate way a person can acquire property is to buy it in exchange for something else that the person owns. If these rules, which are the only fair rules, are followed, then the result is fair. It doesn’t matter how unequally the economic pie is shared, provided that the pie is made by people, each one of whom voluntarily provides services in exchange for the share of the pie offered in compensation.

These rules satisfy the symmetry principle. If these rules are not followed, the symmetry principle is broken. You can see these facts by imagining a world in which the laws are not followed.

First, suppose that some resources or goods are not owned. They are common property. Then everyone is free to participate in a grab to use them. The strongest will prevail. But when the strongest prevails, the strongest effectively owns the resources or goods in question and prevents others from enjoying them.

Second, suppose that we do not insist on voluntary exchange for transferring ownership of resources from one person to another. The alternative is involuntary transfer. In simple language, the alternative is theft.

Both of these situations violate the symmetry principle. Only the strong acquire what they want. The weak end up with only the resources and goods that the strong don’t want.

In a majority-rule political system, the strong are those in the majority or those with enough resources to influence opinion and achieve a majority.

In contrast, if the two rules of fairness are followed, everyone, strong and weak, is treated in a similar way. All individuals are free to use their resources and human skills to create things that are valued by themselves and others and to exchange the fruits of their efforts with all others. This set of arrangements is the only one that obeys the symmetry principle.

Fair Rules and Efficiency

If private property rights are enforced and if voluntary exchange takes place in a competitive market with none of the obstacles described above (p. 115), resources will be allocated efficiently.

According to the Nozick fair rules view, no matter how unequal is the resulting distribution of income and wealth, it will be fair.

It would be better if everyone were as well off as those with the highest incomes, but scarcity prevents that outcome and the best attainable outcome is the efficient one.

Case Study: A Generator Shortage in a Natural Disaster

Hurricane Katrina shut down electricity supplies over a wide area and increased the demand for portable generators. What is the fair way to allocate the available generators?

If the market price is used, the outcome is efficient. Sellers and buyers are better off and no one is worse off. But people who own generators make a larger profit and the generators go to those who want them most and can afford them. Is that fair?

On the Nozick rules view, the outcome is fair. On the fair outcome view, the outcome might be considered unfair. But what are the alternatives? They are command, majority rule, contest, first-come-first-served, lottery, personal characteristics, and force. Except by chance, none of these methods delivers an allocation of generators that is either fair or efficient.

It is unfair in the rules view because the distribution involves involuntary transfers of resources among citizens. It is unfair in the results view because the poorest don’t end up being made as well off as possible.
Is the Competitive Market Fair?

Price Gouging

Price gouging is the practice of offering an essential item for sale following a natural disaster at a price much higher than its normal price.

In the aftermath of Hurricane Katrina, John Shepperson bought 19 generators and rented a U-Haul truck to transport them from his Kentucky home to a town in Mississippi that had lost its electricity supply. He offered the generators to eager buyers at twice the price he had paid for them. But before Mr. Shepperson had made a sale, the Mississippi police confiscated the generators and put him in jail for four days for price gouging.

In Favor of a Law Against Price Gouging

Supporters of laws against price gouging say:
- It unfairly exploits vulnerable needy buyers.
- It unfairly rewards unscrupulous sellers.
- In situations of extraordinary shortage, prices should be regulated to prevent these abuses and scarce resources should be allocated by one of the non-market mechanisms such as majority vote or equal shares for all.

The Economist’s Response

Economists say that preventing a voluntary market transaction leads to inefficiency—it makes some people worse off without making anyone better off.
- In the figure below, when the demand for generators increases from $D_0$ to $D_1$, the equilibrium price rises from $200$ to $600$.
- Calling the price rise “gouging” and blocking it with a law prevents additional units from being made available and creates a deadweight loss.

REVIEW QUIZ

1. What are the two big approaches to thinking about fairness?
2. What is the utilitarian idea of fairness and what is wrong with it?
3. Explain the big tradeoff. What idea of fairness has been developed to deal with it?
4. What is the idea of fairness based on fair rules?

You can work these questions in Study Plan 5.4 and get instant feedback.
Making Traffic Flow Efficiently

Rail No Cure-All for Metro Atlanta’s Traffic Congestion

The Atlanta Journal-Constitution
September 6, 2011

... On its face, the problem seems simple. If a person who commutes alone by car takes the train instead, then that’s one less car on the road. ... Multiple experts told PolitiFact Georgia that even if thousands of drivers take the train rather than a major road, congestion on that road doesn’t end.

It might drop initially, but travelers soon notice the better traffic. Commuters who once avoided the road return. Others take additional trips, or start using it during peak traffic times. People who car pooled start commuting alone.

Eventually, congestion returns, said Anthony Downs, a Brookings Institution fellow who has studied traffic congestion for decades. He thinks congestion is extremely hard to avoid, and likely will grow worse. Brookings is a liberal-leaning think tank. ...

A 2009 University of Toronto study that analyzed interstate highway and vehicle travel data across the United States found there is little evidence that additional public transit reduces traffic. Other researchers have come to similar conclusions.

But there’s another important side to the traffic conundrum ...: Decades of research shows that additional highway lanes don’t end gridlock, either. As with rail, drivers fill up the new lanes. Once again, they’re stuck in traffic.

... In the end, though, the bulk of the experts we interviewed agreed that the one tested way to cut down on gridlock is “congestion pricing.” That’s when drivers pay a surcharge to use roads during peak traffic hours. Cities such as London and Singapore have used the strategy and eased downtown traffic.

ESSENCE OF THE STORY
- There is little evidence that additional public transit or additional freeway lanes reduces road congestion.
- If one car user takes the train, so there is one less car on the road, traffic flows faster and others are encouraged to switch from train to car, so eventually congestion returns.
- Additional drivers fill up new highway lanes and again, congestion returns.
- The one tested way to reduce congestion is congestion pricing—paying to use roads during peak traffic hours.
- London and Singapore use this method to keep traffic moving.
ECONOMIC ANALYSIS

- The Texas Transportation Institute says that in 2010 on 10 stretches of Atlanta’s most congested corridors, 2 million person hours and 6.6 million gallons of gasoline were wasted at a cost of $302 million; and on the nation’s 328 most congested corridors, 78 million person hours and 284 million gallons of gasoline were wasted at a cost of $12.6 billion.

- When one additional vehicle enters an uncongested road, it imposes no costs on other road users. But when one additional vehicle enters a congested road, the traffic slows and time and gasoline costs increase for all road users.

- The figures show the marginal social cost curve (MSC) for a road that can carry 15,000 vehicles per hour with no congestion. Up to 15,000 vehicles per hour, MSC = 0. Above 15,000 vehicles per hour congestion occurs and MSC increases as more vehicles enter the road.

- During the night and at off-peak parts of the day, the marginal social benefit (MSB) and demand for road space is low and there is no congestion.

- Figure 1 illustrates off-peak road use. The demand and marginal benefit curve is $D_o = MSB_o$; the marginal cost curve is MSC; and the equilibrium and efficient outcome occurs at a zero price for road use.

- Figure 2 illustrates road use at a peak congestion time. The demand and marginal benefit curve is $D_p = MSB_p$ and with a zero price for road use, 40,000 vehicles per hour enter the road. There is a deadweight loss (of time and gasoline) shown by the gray triangle.

- Imposing a congestion charge of $2 per mile brings an equilibrium at 25,000 vehicles per hour, which is the efficient quantity. In this situation, total surplus, the sum of consumer surplus (green) plus producer surplus (blue), is maximized.

- Singapore has the world’s most sophisticated congestion pricing with the price displayed on gantries (see photo), and the price rises as congestion increases and falls as congestion eases.

Traffic grinds to a halt on a U.S. freeway, but electronic Road Pricing (ERP) keeps vehicles moving in Singapore.
CHAPTER 5 Efficiency and Equity

Summary

Key Points

Resource Allocation Methods (pp. 106–107)
- Because resources are scarce, some mechanism must allocate them.
- The alternative allocation methods are market price; command; majority rule; contest; first-come, first-served; lottery; personal characteristics; and force.

Working Study Plan Problems 1 and 2 will give you a better understanding of resource allocation methods.

Benefit, Cost, and Surplus (pp. 108–111)
- The maximum price willingly paid is marginal benefit, so a demand curve is also a marginal benefit curve.
- The market demand curve is the horizontal sum of the individual demand curves and is the marginal social benefit curve.
- Value is what people are willing to pay; price is what people must pay.
- Consumer surplus is the excess of the benefit received from a good or service over the amount paid for it.
- The minimum supply-price is marginal cost, so a supply curve is also a marginal cost curve.
- The market supply curve is the horizontal sum of the individual supply curves and is the marginal social cost curve.
- Cost is what producers pay; price is what producers receive.
- Producer surplus is the excess of the amount received from the sale of a good or service over the cost of producing it.

Working Study Plan Problems 3 to 10 will give you a better understanding of benefit, cost, and surplus.

Is the Competitive Market Efficient? (pp. 112–115)
- In a competitive equilibrium, marginal social benefit equals marginal social cost and resource allocation is efficient.
- Buyers and sellers acting in their self-interest end up promoting the social interest.
- Total surplus, consumer surplus plus producer surplus, is maximized.
- Producing less than or more than the efficient quantity creates deadweight loss.
- Price and quantity regulations; taxes and subsidies; externalities; public goods and common resources; monopoly; and high transactions costs can lead to market failure.

Working Study Plan Problems 11 to 13 will give you a better understanding of the efficiency of competitive markets.

Is the Competitive Market Fair? (pp. 116–119)
- Ideas about fairness can be divided into two groups: fair results and fair rules.
- Fair-results ideas require income transfers from the rich to the poor.
- Fair-rules ideas require property rights and voluntary exchange.

Working Study Plan Problems 14 and 15 will give you a better understanding of the fairness of competitive markets.

Key Terms

Big tradeoff, 117
Command system, 106
Consumer surplus, 109
Deadweight loss, 113
Market failure, 113
Producer surplus, 111
Symmetry principle, 118
Total surplus, 112
Transactions costs, 115
Utilitarianism, 116
b. What is the market consumer surplus when the price is $4 a mile?
Use the following table to work Problems 6 to 8. The table gives the supply schedules of hot air balloon rides for the only sellers in the market, Xavier, Yasmin, and Zack.

<table>
<thead>
<tr>
<th>Price (dollars per ride)</th>
<th>Quantity supplied (rides per week)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Xavier</td>
</tr>
<tr>
<td>100</td>
<td>30</td>
</tr>
<tr>
<td>90</td>
<td>25</td>
</tr>
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<td>80</td>
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<td>50</td>
<td>5</td>
</tr>
<tr>
<td>40</td>
<td>0</td>
</tr>
</tbody>
</table>

6. a. Construct the market supply schedule.
   b. What are the minimum prices that Xavier, Yasmin, and Zack are willing to accept to supply 20 rides? Why?

7. a. What is the marginal social cost when the total number of rides is 30?
   b. What is the marginal cost for each supplier when the total number of rides is 30 and how many rides does each of the firms supply?

8. When the price is $70 a ride, what is each firm’s producer surplus? What is the market producer surplus?
Use the following news clip to work Problems 9 and 10.

eBay Saves Billions for Bidders
If you think you would save money by bidding on eBay auctions, you would likely be right. Two Maryland researchers calculated the difference between the actual purchase price paid for auction items and the top price bidders stated they were willing to pay. They found that the difference averaged at least $4 per auction.

Source: InformationWeek, January 28, 2008

9. What method is used to allocate goods on eBay? How does the allocation method used by eBay auctions influence consumer surplus?
CHAPTER 5 Efficiency and Equity

10. a. Can an eBay auction give the seller a surplus?
b. On a graph show the consumer surplus and producer surplus from an eBay auction.

Is the Competitive Market Efficient? (Study Plan 5.3)

11. The figure illustrates the competitive market for cell phones.

\[ \begin{array}{c|c|c}
\text{Price (dollars per cell phone)} & \text{Quantity demanded} & \text{Quantity supplied} \\
0 & 400 & 0 \\
5 & 300 & 100 \\
10 & 200 & 200 \\
15 & 100 & 300 \\
20 & 0 & 400 \\
\end{array} \]

Sunscreen factories are required to limit production to 100 bottles a day.
a. What is the maximum price that consumers are willing to pay for the 100th bottle?
b. What is the minimum price that producers are willing to accept for the 100th bottle?
c. Describe the situation in this market.

12. The table gives the demand and supply schedules for sunscreen.

Is the Competitive Market Fair? (Study Plan 5.4)

14. Explain why the allocation method used by each restaurant in Problem 1 is fair or not fair.
15. In Problem 12, how can the 100 bottles available be allocated to beach-goers? Which possible methods would be fair and which would be unfair?

Economics in the News (Study Plan 5.N)

16. The World's Largest Tulip and Flower Market
Every day 20 million tulips, roses, and other cut flowers are auctioned at the Dutch market called The Bloemenveiling. Each day 55,000 Dutch auctions take place, matching buyers and sellers.

Source: Tulip-Bulbs.com

A Dutch auction is one in which the auctioneer starts by announcing the highest price. If no one offers to buy the flowers, the auctioneer lowers the price until a buyer is found.
a. What method is used to allocate flowers at the Bloemenveiling?
b. How does a Dutch flower auction influence consumer surplus and producer surplus?
c. Are the flower auctions at the Bloemenveiling efficient?

17. Wii Sells Out Across Japan
After a two-month TV-ad blitz for Wii in Japan, demand was expected to exceed supply. Yodobashi Camera was selling Wii games on a first-come, first-served basis. Eager customers showed up early and those who tried to join the line after 6 or 7 a.m. were turned away—many rushed off to the smaller stores that were holding raffles to decide who got a Wii.

Source: Gamespot News, December 1, 2006

a. Why was the quantity demanded of Wii expected to exceed the quantity supplied?
b. Did Nintendo produce the efficient quantity of Wii? Explain.
c. Can you think of reasons why Nintendo might want to underproduce and leave the market with fewer Wii than people want to buy?
d. What are the two methods of resource allocation described in the news clip? Is either method of allocating Wii efficient?
e. What do you think some of the people who managed to buy a Wii did with it?
f. Explain which is the fairer method of allocating the Wii: the market price or the two methods described in the news clip.

10. a. Can an eBay auction give the seller a surplus?
b. On a graph show the consumer surplus and producer surplus from an eBay auction.

Is the Competitive Market Efficient? (Study Plan 5.3)

11. The figure illustrates the competitive market for cell phones.

\[ \begin{array}{c|c|c}
\text{Price (dollars per cell phone)} & \text{Quantity demanded} & \text{Quantity supplied} \\
15.00 & 0 & 400 \\
30.00 & 0 & 300 \\
45.00 & 0 & 200 \\
60.00 & 0 & 100 \\
\end{array} \]

a. What are the equilibrium price and equilibrium quantity of cell phones?
b. Shade in and label the consumer surplus at the competitive equilibrium.
c. Shade in and label the producer surplus at the competitive equilibrium.
d. Calculate total surplus at the competitive equilibrium.
e. Is the competitive market for cell phones efficient?
18. At McDonald’s, no reservations are accepted; at Puck’s at St. Louis Art Museum, reservations are accepted; at the Bissell Mansion restaurant, reservations are essential. Describe the method of allocating table resources in these three restaurants. Why do you think restaurants have different reservations policies?

Benefit, Cost, and Surplus

Use the following table to work Problems 19 to 22. The table gives the supply schedules for jet-ski rides by the only suppliers: Rick, Sam, and Tom.

<table>
<thead>
<tr>
<th>Price (dollars per ride)</th>
<th>Quantity supplied (rides per day)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Rick</td>
</tr>
<tr>
<td>10.00</td>
<td>0</td>
</tr>
<tr>
<td>12.50</td>
<td>5</td>
</tr>
<tr>
<td>15.00</td>
<td>10</td>
</tr>
<tr>
<td>17.50</td>
<td>15</td>
</tr>
<tr>
<td>20.00</td>
<td>20</td>
</tr>
</tbody>
</table>

19. What is each owner’s minimum supply-price of 10 rides a day?

20. Which owner has the largest producer surplus when the price of a ride is $17.50? Explain.

21. What is the marginal social cost of 45 rides a day?

22. Construct the market supply schedule of jet-ski rides.

23. The table gives the demand and supply schedules for sandwiches.

<table>
<thead>
<tr>
<th>Price (dollars per sandwich)</th>
<th>Quantity demanded (sandwiches per hour)</th>
<th>Quantity supplied (sandwiches per hour)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Rick</td>
<td>Sam</td>
</tr>
<tr>
<td>0</td>
<td>300</td>
<td>0</td>
</tr>
<tr>
<td>1</td>
<td>250</td>
<td>50</td>
</tr>
<tr>
<td>2</td>
<td>200</td>
<td>100</td>
</tr>
<tr>
<td>3</td>
<td>150</td>
<td>150</td>
</tr>
<tr>
<td>4</td>
<td>100</td>
<td>200</td>
</tr>
<tr>
<td>5</td>
<td>75</td>
<td>250</td>
</tr>
<tr>
<td>6</td>
<td>0</td>
<td>300</td>
</tr>
</tbody>
</table>

a. What is the maximum price that consumers are willing to pay for the 200th sandwich?
b. What is the minimum price that producers are willing to accept for the 200th sandwich?
c. If 200 sandwiches a day are available, what is the total surplus?

24. “Two Buck Chuck” Wine Cult

“Two Buck Chuck” is a cheap, good wine. After a year flooding the West Coast market, it is still being sold by the case to wine lovers. An over-abundance of grapes has made the wine cheap to bottle—about 5 million cases so far.

Source: CBS, June 2, 2003

How has “Two Buck Chuck” influenced the consumer surplus from wine, the producer surplus for its producer, and the producer surplus for the producers of other wines?

Is the Competitive Market Efficient?

25. Use the data in the table in Problem 23.

a. If the sandwich market is efficient, what is the consumer surplus, what is the producer surplus, and what is the total surplus?
b. If the demand for sandwiches increases and sandwich makers produce the efficient quantity, what happens to producer surplus and deadweight loss?

Use the following news clip to work Problems 26 to 28.

The Right Price for Digital Music

Apple’s $1.29-for-the-latest-songs model isn’t perfect and isn’t it too much to pay for music that appeals to just a few people? What we need is a system that will be profitable but fair to music lovers. The solution: Price song downloads according to demand. The more people who download a particular song, the higher will be the price of that song; the fewer people who buy a particular song, the lower will be the price of that song. That is a free-market solution—the market would determine the price.

Source: Slate, December 5, 2005

Assume that the marginal social cost of downloading a song from the iTunes Store is zero. (This assumption means that the cost of operating the iTunes Store doesn’t change if people download more songs.)

26. a. Draw a graph of the market for downloadable music with a price of $1.29 for all the latest songs. On your graph, show consumer surplus and producer surplus.
b. With a price of $1.29 for all the latest songs, is the market efficient or inefficient? If it is inefficient, show the deadweight loss on your graph.
27. If the pricing scheme described in the news clip were adopted, how would consumer surplus, producer surplus, and the deadweight loss change?

28. a. If the pricing scheme described in the news clip were adopted, would the market be efficient or inefficient? Explain.
   b. Is the pricing scheme described in the news clip a "free-market solution"? Explain.

29. Only 1 percent of the world supply of water is fit for human consumption. Some places have more water than they can use; some could use much more than they have. The 1 percent available would be sufficient if only it were in the right place.
   a. What is the major problem in achieving an efficient use of the world’s water?
   b. If there were a global market in water, like there is in oil, how do you think the market would be organized?
   c. Would a free world market in water achieve an efficient use of the world’s water resources? Explain why or why not.

30. Use the information in Problem 28. Would a free world market in water achieve a fair use of the world’s water resources? Explain why or why not and be clear about the concept of fairness that you are using.

31. The winner of the men’s and women’s tennis singles at the U.S. Open is paid twice as much as the runner-up, but it takes two players to have a singles final. Is the compensation arrangement fair?

32. The Scandal of Phone Call Price Gouging by Prisons
   In most states, the phone company guarantees the prison a commission of a percentage on every call. The average commission is 42% of the cost of the call, but in some states it is 60%. So 60% of what families pay to receive a collect call from their imprisoned relative has nothing to do with the cost of the phone service. Also, the phone company that offers the highest commission is often the company to get the prison contract.
   

33. After you have studied Reading Between the Lines on pp. 120–121, answer the following questions.
   a. What is the method used to allocate highway space in the United States and what is the method used in Singapore?
   b. Who benefits from the U.S. method of highway resource allocation? Explain your answer using the ideas of marginal social benefit, marginal social cost, consumer surplus, and producer surplus.
   c. Who benefits from the Singaporean method of highway resource allocation? Explain your answer using the ideas of marginal social benefit, marginal social cost, consumer surplus, and producer surplus.
   d. If road use were rationed by limiting drivers with even-date birthdays to drive only on even days (and odd-date birthdays to drive only on odd days), would highway use be more efficient? Explain your answer.

34. Fight over Water Rates; Escondido Farmers Say Increase Would Put Them Out of Business
   Agricultural users of water pay less than residential and business users. Since 1993, water rates have increased by more than 90 percent for residential customers and by only 50 percent for agricultural users.
   
   Source: The San Diego Union-Tribune, June 14, 2006
   a. Do you think that the allocation of water between agricultural and residential users is likely to be efficient? Explain your answer.
   b. If agricultural users paid a higher price, would the allocation of resources be more efficient?
   c. If agricultural users paid a higher price, what would happen to consumer surplus and producer surplus from water?
   d. Is the difference in price paid by agricultural and residential users fair?
After studying this chapter, you will be able to:

- Explain how a rent ceiling creates a housing shortage
- Explain how a minimum wage law creates unemployment
- Explain the effects of a tax
- Explain the effects of production quotas and subsidies
- Explain how markets for illegal goods work

**GOVERNMENT ACTIONS IN MARKETS**

Can governments cap rents to help low-income renters live in affordable housing and raise incomes of low-paid workers with a minimum wage law? Who really pays the sales tax: buyers or sellers? Do subsidies to farmers and production limits help to make markets efficient? How do markets work in the “underground economy” where people trade illegal goods? These are the questions you study in this chapter. In *Reading Between the Lines* at the end of the chapter, we apply what you have learned and examine the effects of the New York minimum wage in the Buffalo-Niagara region labor market.
We spend more of our income on housing than on any other good or service, so it isn’t surprising that rents can be a political issue. When rents are high, or when they jump by a large amount, renters might lobby the government for limits on rents.

A government regulation that makes it illegal to charge a price higher than a specified level is called a price ceiling or price cap.

The effects of a price ceiling on a market depend crucially on whether the ceiling is imposed at a level that is above or below the equilibrium price.

A price ceiling set above the equilibrium price has no effect. The reason is that the price ceiling does not constrain the market forces. The force of the law and the market forces are not in conflict. But a price ceiling below the equilibrium price has powerful effects on a market. The reason is that the price ceiling attempts to prevent the price from regulating the quantities demanded and supplied. The force of the law and the market forces are in conflict.

When a price ceiling is applied to a housing market, it is called a rent ceiling. A rent ceiling set below the equilibrium rent creates:

- A housing shortage
- Increased search activity
- A black market

A Housing Shortage

At the equilibrium price, the quantity demanded equals the quantity supplied. In a housing market, when the rent is at the equilibrium level, the quantity of housing supplied equals the quantity of housing demanded and there is neither a shortage nor a surplus of housing.

But at a rent set below the equilibrium rent, the quantity of housing demanded exceeds the quantity of housing supplied—there is a shortage. So if a rent ceiling is set below the equilibrium rent, there will be a shortage of housing.

When there is a shortage, the quantity available is the quantity supplied, and somehow this quantity must be allocated among the frustrated demanders. One way in which this allocation occurs is through increased search activity.

Increased Search Activity

The time spent looking for someone with whom to do business is called search activity. We spend some time in search activity almost every time we make a purchase. When you’re shopping for the latest hot new cell phone, and you know four stores that stock it, how do you find which store has the best deal? You spend a few minutes on the Internet, checking out the various prices. In some markets, such as the housing market, people spend a lot of time checking the alternatives available before making a choice.

When a price is regulated and there is a shortage, search activity increases. In the case of a rent-controlled housing market, frustrated would-be renters scan the newspapers, not only for housing ads but also for death notices! Any information about newly available housing is useful, and apartment seekers race to be first on the scene when news of a possible supplier breaks.

The opportunity cost of a good is equal not only to its price but also to the value of the search time spent finding the good. So the opportunity cost of housing is equal to the rent (a regulated price) plus the time and other resources spent searching for the restricted quantity available. Search activity is costly. It uses time and other resources, such as phone calls, automobiles, and gasoline that could have been used in other productive ways.

A rent ceiling controls only the rent portion of the cost of housing. The cost of increased search activity might end up making the full cost of housing higher than it would be without a rent ceiling.

A Black Market

A rent ceiling also encourages illegal trading in a black market, an illegal market in which the equilibrium price exceeds the price ceiling. Black markets occur in rent-controlled housing and many other markets. For example, scalpers run black markets in tickets for big sporting events and rock concerts.

When a rent ceiling is in force, frustrated renters and landlords constantly seek ways of increasing rents. One common way is for a new tenant to pay a high price for worthless fittings, such as charging $2,000 for threadbare drapes. Another is for the tenant to pay an exorbitant price for new locks and keys—called “key money.”

The level of a black market rent depends on how tightly the rent ceiling is enforced. With loose
A Housing Market with a Rent Ceiling

Inefficiency of a Rent Ceiling

A rent ceiling set below the equilibrium rent results in an inefficient underproduction of housing services. The marginal social benefit of housing exceeds its marginal social cost and a deadweight loss shrinks the producer surplus and consumer surplus (Chapter 5, pp. 112–114).

Figure 6.2 shows this inefficiency. The rent ceiling ($800 per month) is below the equilibrium rent ($1,000 per month) and the quantity of housing supplied (60,000 units) is less than the efficient quantity (80,000 units).

Because the quantity of housing supplied (the quantity available) is less than the efficient quantity, there is a deadweight loss, shown by the gray triangle. Producer surplus shrinks to the blue triangle and consumer surplus shrinks to the green triangle. The red rectangle represents the potential loss from increased search activity. This loss is borne by consumers and the full loss from the rent ceiling is the sum of the deadweight loss and the increased cost of search.

FIGURE 6.1 A Rent Ceiling

A rent above the rent ceiling of $800 a month is illegal (in the gray-shaded illegal region). At a rent of $800 a month, the quantity of housing supplied is 60,000 units. Frustrated renters spend time searching for housing and they make deals with landlords in a black market. Someone is willing to pay $1,200 a month for the 60,000th unit.

FIGURE 6.2 The Inefficiency of a Rent Ceiling

Without a rent ceiling, the market produces an efficient 80,000 units of housing at a rent of $1,000 a month. A rent ceiling of $800 a month decreases the quantity of housing supplied to 60,000 units. Producer surplus and consumer surplus shrink and a deadweight loss arises. The red rectangle represents the cost of resources used in increased search activity. The full loss from the rent ceiling equals the sum of the red rectangle and gray triangle.
Are Rent Ceilings Fair?

Rent ceilings might be inefficient, but don’t they achieve a fairer allocation of scarce housing? Let’s explore this question.

Chapter 5 (pp. 116–118) reviews two key ideas about fairness. According to the fair rules view, anything that blocks voluntary exchange is unfair, so rent ceilings are unfair. But according to the fair result view, a fair outcome is one that benefits the less well off. So according to this view, the fairest outcome is the one that allocates scarce housing to the poorest. To see whether rent ceilings help to achieve a fairer outcome in this sense, we need to consider how the market allocates scarce housing resources in the face of a rent ceiling.

Blocking rent adjustments doesn’t eliminate scarcity. Rather, because it decreases the quantity of housing available, it creates an even bigger challenge for the housing market. Somehow, the market must ration a smaller quantity of housing and allocate that housing among the people who demand it.

When the rent is not permitted to allocate scarce housing, what other mechanisms are available, and are they fair? Some possible mechanisms are

- A lottery
- First-come, first-served
- Discrimination

A lottery allocating housing to those who are lucky, not to those who are poor. First-come, first-served (a method used to allocate housing in England after World War II) allocates housing to those who have the greatest foresight and who get their names on a list first, not to the poorest. Discrimination allocates scarce housing based on the views and self-interest of the owner of the housing. In the case of public housing, what counts is the self-interest of the bureaucracy that administers the allocation.

In principle, self-interested owners and bureaucrats could allocate housing to satisfy some criterion of fairness, but they are not likely to do so. Discrimination based on friendship, family ties, and criteria such as race, ethnicity, or sex is more likely to enter the equation. We might make such discrimination illegal, but we cannot prevent it from occurring.

It is hard, then, to make a case for rent ceilings on the basis of fairness. When rent adjustments are blocked, other methods of allocating scarce housing resources operate that do not produce a fair outcome.

Economics in Action

Rent Control Winners: The Rich and Famous

New York, San Francisco, London, and Paris, four of the world’s great cities, have rent ceilings in some part of their housing markets. Boston had rent ceilings for many years but abolished them in 1997. Many other U.S. cities do not have, and have never had, rent ceilings. Among them are Atlanta, Baltimore, Chicago, Dallas, Philadelphia, Phoenix, and Seattle.

To see the effects of rent ceilings in practice we can compare the housing markets in cities with ceilings with those without ceilings. We learn two main lessons from such a comparison.

First, rent ceilings definitely create a housing shortage. Second, they do lower the rents for some but raise them for others.

A survey* conducted in 1997 showed that the rents of housing units actually available for rent were 2.5 times the average of all rents in New York but equal to the average rent in Philadelphia. The winners from rent ceilings are the families that have lived in a city for a long time. In New York, these families include some rich and famous ones. The voting power of the winners keeps the rent ceilings in place. Mobile newcomers are the losers in a city with rent ceilings.

The bottom line is that, in principle and in practice, rent ceilings are inefficient and unfair.


REVIEW QUIZ

1. What is a rent ceiling and what are its effects if it is set above the equilibrium rent?
2. What are the effects of a rent ceiling that is set below the equilibrium rent?
3. How are scarce housing resources allocated when a rent ceiling is in place?
4. Why does a rent ceiling create an inefficient and unfair outcome in the housing market?

You can work these questions in Study Plan 6.1 and get instant feedback. MyEconLab

You now know how a price ceiling (rent ceiling) works. Next, we’ll learn about the effects of a price floor by studying a minimum wage in a labor market.
A Labor Market with a Minimum Wage

For each one of us, the labor market is the market that influences the jobs we get and the wages we earn. Firms decide how much labor to demand, and the lower the wage rate, the greater is the quantity of labor demanded. Households decide how much labor to supply, and the higher the wage rate, the greater is the quantity of labor supplied. The wage rate adjusts to make the quantity of labor demanded equal to the quantity supplied.

When wage rates are low, or when they fail to keep up with rising prices, labor unions might turn to governments and lobby for a higher wage rate.

A government regulation that makes it illegal to charge a price lower than a specified level is called a price floor.

The effects of a price floor on a market depend crucially on whether the floor is imposed at a level that is above or below the equilibrium price.

A price floor set below the equilibrium price has no effect. The reason is that the price floor does not constrain the market forces. The force of the law and the market forces are not in conflict. But a price floor above the equilibrium price has powerful effects on a market. The reason is that the price floor attempts to prevent the price from regulating the quantities demanded and supplied. The force of the law and the market forces are in conflict.

When a price floor is applied to a labor market, it is called a minimum wage. A minimum wage imposed at a level that is above the equilibrium wage creates unemployment. Let’s look at the effects of a minimum wage.

Minimum Wage Brings Unemployment

At the equilibrium price, the quantity demanded equals the quantity supplied. In a labor market, when the wage rate is at the equilibrium level, the quantity of labor supplied equals the quantity of labor demanded: There is neither a shortage of labor nor a surplus of labor.

But at a wage rate above the equilibrium wage, the quantity of labor supplied exceeds the quantity of labor demanded—there is a surplus of labor. So when a minimum wage is set above the equilibrium wage, there is a surplus of labor. The demand for labor determines the level of employment, and the surplus of labor is unemployed.

Figure 6.3 illustrates the effect of the minimum wage on unemployment. The demand for labor curve is \( D \) and the supply of labor curve is \( S \). The horizontal red line shows the minimum wage set at \($7\) an hour. At the minimum wage of \($7\) an hour, 20 million hours are hired but 22 million hours are available. Unemployment—\( AB \)—of 2 million hours a year is created. With only 20 million hours demanded, someone is willing to supply the 20 millionth hour for \($5\).

Is the Minimum Wage Fair?

The minimum wage is unfair on both views of fairness: It delivers an unfair result and imposes an unfair rule.

The result is unfair because only those people who have jobs and keep them benefit from the minimum
wage. The unemployed end up worse off than they would be with no minimum wage. Some of those who search for jobs and find them end up worse off because of the increased cost of job search they incur. Also those who search and find jobs aren’t always the least well off. When the wage rate doesn’t allocate labor, other mechanisms determine who finds a job. One such mechanism is discrimination, which is yet another source of unfairness.

The minimum wage imposes an unfair rule because it blocks voluntary exchange. Firms are willing to hire more labor and people are willing to work more, but they are not permitted by the minimum wage law to do so.

**Inefficiency of a Minimum Wage**

In the labor market, the supply curve measures the marginal social cost of labor to workers. This cost is leisure forgone. The demand curve measures the marginal social benefit from labor. This benefit is the value of the goods and services produced. An unregulated labor market allocates the economy’s scarce labor resources to the jobs in which they are valued most highly. The market is efficient.

The minimum wage frustrates the market mechanism and results in unemployment and increased job search. At the quantity of labor employed, the marginal social benefit of labor exceeds its marginal social cost and a deadweight loss shrinks the firms’ surplus and the workers’ surplus.

Figure 6.4 shows this inefficiency. The minimum wage ($7 an hour) is above the equilibrium wage ($6 an hour) and the quantity of labor demanded and employed (20 million hours) is less than the efficient quantity (21 million hours).

Because the quantity of labor employed is less than the efficient quantity, there is a deadweight loss, shown by the gray triangle. The firms’ surplus shrinks to the blue triangle and the workers’ surplus shrinks to the green triangle. The red rectangle shows the potential loss from increased job search, which is borne by workers. The full loss from the minimum wage is the sum of the deadweight loss and the increased cost of job search.

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**AT ISSUE**

**Does the Minimum Wage Cause Unemployment?**

In the United States, the federal government’s Fair Labor Standards Act sets the minimum wage, which has fluctuated between 35 percent and 50 percent of the average wage, and in 2012 it was $7.25 an hour. Most states have minimum wages that exceed the federal minimum.

Does the minimum wage result in unemployment, and if so, how much unemployment does it create?

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**No, It Doesn’t**

David Card of the University of California at Berkeley (see p. 488) and Alan Krueger of Princeton University and who is President Obama’s chief economic adviser say:

- An increase in the minimum wage increases teenage employment and decreases unemployment.
- Their study of minimum wages in California, New Jersey, and Texas found that the employment rate of low-income workers increased following an increase in the minimum wage.
- A higher wage increases employment by making workers more conscientious and productive as well as less likely to quit, which lowers unproductive labor turnover.
- A higher wage rate makes managers seek ways to increase labor productivity.

**Yes, It Does**

Most economists are skeptical about Card and Krueger’s conclusion.

- The consensus view is that a 10 percent rise in the minimum wage decreases teenage employment by between 1 and 3 percent.
- Firms freely pay wage rates above the equilibrium wage to encourage more productive work habits.
- Daniel Hamermesh of the University of Texas at Austin says that firms anticipate the rise and cut employment before the minimum wage goes up.
- Finis Welch of Texas A&M University and Kevin Murphy of the University of Chicago say the employment effects that Card and Krueger found are caused by regional differences in economic growth and not by a rise in the minimum wage.
Everything you earn and almost everything you buy is taxed. Income taxes and Social Security taxes are deducted from your earnings and sales taxes are added to the bill when you buy something. Employers also pay a Social Security tax for their workers, and producers of tobacco products, alcoholic drinks, and gasoline pay a tax every time they sell something.

Who really pays these taxes? Because the income tax and Social Security tax are deducted from your pay, and the sales tax is added to the prices you pay, isn’t it obvious that you pay these taxes? And isn’t it equally obvious that your employer pays the employer’s contribution to the Social Security tax and that tobacco producers pay the tax on cigarettes?

You’re going to discover that it isn’t obvious who really pays a tax and that lawmakers don’t make that decision. We begin with a definition of tax incidence.

**Tax Incidence**

Tax incidence is the division of the burden of a tax between buyers and sellers. When the government imposes a tax on the sale of a good,* the price paid by buyers might rise by the full amount of the tax, by a lesser amount, or not at all. If the price paid by buyers rises by the full amount of the tax, then the burden of the tax falls entirely on buyers—the buyers pay the tax. If the price paid by buyers rises by a lesser amount than the tax, then the burden of the tax falls partly on buyers and partly on sellers. And if the price paid by buyers doesn’t change at all, then the burden of the tax falls entirely on sellers.

Tax incidence does not depend on the tax law. The law might impose a tax on sellers or on buyers, but the outcome is the same in either case. To see why, let’s look at the tax on cigarettes in New York City.

**A Tax on Sellers**

On July 1, 2002, Mayor Bloomberg put a tax of $1.50 a pack on cigarettes sold in New York City. To work out the effects of this tax on the sellers of cigarettes, we begin by examining the effects on demand and supply in the market for cigarettes.

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*These propositions also apply to services and factors of production (land, labor, and capital).
In Fig. 6.5, the demand curve is $D$, and the supply curve is $S$. With no tax, the equilibrium price is $3$ per pack and $350$ million packs a year are bought and sold.

A tax on sellers is like an increase in cost, so it decreases supply. To determine the position of the new supply curve, we add the tax to the minimum price that sellers are willing to accept for each quantity sold. You can see that without the tax, sellers are willing to offer $350$ million packs a year for $3$ a pack. So with a $1.50$ tax, they will offer $350$ million packs a year only if the price is $4.50$ a pack. The supply curve shifts to the red curve labeled $S+\text{tax on sellers}$.

Equilibrium occurs where the new supply curve intersects the demand curve at $325$ million packs a year. The price paid by buyers rises by $1$ to $4$ a pack. And the price received by sellers falls by $50\$ to $2.50$ a pack. So buyers pay $1$ of the tax and sellers pay the other $50\$.

**A Tax on Buyers**

Suppose that instead of taxing sellers, New York City taxes cigarette buyers $1.50$ a pack.

A tax on buyers lowers the amount they are willing to pay sellers, so it decreases demand and shifts the demand curve leftward. To determine the position of this new demand curve, we subtract the tax from the maximum price that buyers are willing to pay for each quantity bought. You can see, in Fig. 6.6, that without the tax, buyers are willing to buy $350$ million packs a year for $3$ a pack. So with a $1.50$ tax, they are willing to buy $350$ million packs a year only if the price including the tax is $3.50$ a pack, which means that they’re willing to pay sellers only $1.50$ a pack. The demand curve shifts to become the red curve labeled $D–\text{tax on buyers}$.

Equilibrium occurs where the new demand curve intersects the supply curve at a quantity of $325$ million packs a year. The price received by sellers is $2.50$ a pack, and the price paid by buyers is $4.

**Equivalence of Tax on Buyers and Sellers**

You can see that the tax on buyers in Fig. 6.6 has the same effects as the tax on sellers in Fig. 6.5. In both cases, the equilibrium quantity decreases to $325$ million packs a year, the price paid by buyers rises to $4$ a pack, and the price received by sellers falls to $2.50$ a pack. Buyers pay $1$ of the $1.50$ tax, and sellers pay the other $50\$. Of the tax.

**Can We Share the Burden Equally?** Suppose that Mayor Bloomberg wants the burden of the cigarette tax to fall equally on buyers and sellers and declares that a $75\$ tax be imposed on each. Is the burden of the tax then shared equally?

You can see that it is not. The tax is still $1.50 a pack. You’ve seen that the tax has the same effect regardless of whether it is imposed on sellers or buyers. So imposing half the tax on sellers and half on buyers is like an average of the two cases you’ve just examined. (Draw the demand-supply graph and work out what happens in this case. The demand curve shifts downward by $75\$ and the supply curve shifts upward by $75\$. The new equilibrium quantity is still $325$ million packs a year. Buyers pay $4$ a pack, of which $75\$ is tax. Sellers receive $3.25$ from buyers, but pay a $75\$ tax, so sellers net $2.50 a pack.)

When a transaction is taxed, there are two prices: the price paid by buyers, which includes the tax; and the price received by sellers, which excludes the tax.

**FIGURE 6.5 A Tax on Sellers**

With no tax, $350$ million packs a year are bought and sold at $3$ a pack. A tax on sellers of $1.50$ a pack shifts the supply curve from $S$ to $S+\text{tax on sellers}$. The equilibrium quantity decreases to $325$ million packs a year, the price paid by buyers rises to $4$ a pack, and the price received by sellers falls to $2.50$ a pack. The tax raises the price paid by buyers by less than the tax and lowers the price received by sellers, so buyers and sellers share the burden of the tax.

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MyEconLab animation
Taxes

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Tax Incidence and Elasticity of Demand

The division of the tax between buyers and sellers depends in part on the elasticity of demand. There are two extreme cases:

- Perfectly inelastic demand—buyers pay.
- Perfectly elastic demand—sellers pay.

Perfectly Inelastic Demand

Figure 6.7 shows the market for insulin, a vital daily medication for those with diabetes. Demand is perfectly inelastic at 100,000 doses a day, regardless of the price, as shown by the vertical demand curve $D$. That is, a diabetic would sacrifice all other goods and services rather than not consume the insulin dose that provides good health. The supply curve of insulin is $S$. With no tax, the price is $2$ a dose and the quantity is 100,000 doses a day.

If insulin is taxed at 20¢ a dose, we must add the tax to the minimum price at which drug companies are willing to sell insulin. The result is the new supply curve $S + \text{tax}$. The price rises to $2.20$ a dose, but the quantity does not change. Buyers pay the entire tax of 20¢ a dose.

MyEconLab animation

Buyers respond to the price that includes the tax and sellers respond to the price that excludes the tax.

A tax is like a wedge between the price buyers pay and the price sellers receive. The size of the wedge determines the effects of the tax, not the side of the market on which the government imposes the tax.

The Social Security Tax

The Social Security tax is an example of a tax that Congress imposes equally on both buyers and sellers. But the principles you’ve just learned apply to this tax too. The market for labor, not Congress, decides how the burden of the Social Security tax is divided between firms and workers.

In the New York City cigarette tax example, buyers bear twice the burden of the tax borne by sellers. In special cases, either buyers or sellers bear the entire burden. The division of the burden of a tax between buyers and sellers depends on the elasticities of demand and supply, as you will now see.

MyEconLab animation

In this market for insulin, demand is perfectly inelastic. With no tax, the price is $2$ a dose and the quantity is 100,000 doses a day. A tax of 20¢ a dose shifts the supply curve to $S + \text{tax}$. The price rises to $2.20$ a dose, but the quantity bought does not change. Buyers pay the entire tax.
**Perfectly Elastic Demand** Figure 6.8 shows the market for pink marker pens. Demand is perfectly elastic at $1 a pen, as shown by the horizontal demand curve $D$. If pink pens are less expensive than the other colors, everyone uses pink. If pink pens are more expensive than other colors, no one uses pink. The supply curve is $S$. With no tax, the price of a pink pen is $1 and the quantity is 4,000 pens a week.

Suppose that the government imposes a tax of 10¢ a pen on pink marker pens but not on other colors. The new supply curve is $S + \text{tax}$. The price remains at $1 a pen, and the quantity decreases to 1,000 pink pens a week. The 10¢ tax leaves the price paid by buyers unchanged but lowers the amount received by sellers by the full amount of the tax. Sellers pay the entire tax of 10¢ a pink pen.

We’ve seen that when demand is perfectly inelastic, buyers pay the entire tax and when demand is perfectly elastic, sellers pay the entire tax. In the usual case, demand is neither perfectly inelastic nor perfectly elastic and the tax is split between buyers and sellers. But the division depends on the elasticity of demand: The more inelastic the demand, the larger is the amount of the tax paid by buyers.

*FIGURE 6.8  Tax with Perfectly Elastic Demand*

In this market for pink pens, demand is perfectly elastic. With no tax, the price of a pen is $1 and the quantity is 4,000 pens a week. A tax of 10¢ a pink pen shifts the supply curve to $S + \text{tax}$. The price remains at $1 a pen, and the quantity of pink pens sold decreases to 1,000 a week. Sellers pay the entire tax.

**Tax Incidence and Elasticity of Supply**

The division of the tax between buyers and sellers also depends, in part, on the elasticity of supply. Again, there are two extreme cases:

- Perfectly inelastic supply—sellers pay.
- Perfectly elastic supply—buyers pay.

**Perfectly Inelastic Supply** Figure 6.9(a) shows the market for water from a mineral spring that flows at a constant rate that can’t be controlled. Supply is perfectly inelastic at 100,000 bottles a week, as shown by the supply curve $S$. The demand curve for the water from this spring is $D$. With no tax, the price is 50¢ a bottle and the quantity is 100,000 bottles.

Suppose this spring water is taxed at 5¢ a bottle. The supply curve does not change because the spring owners still produce 100,000 bottles a week, even though the price they receive falls. But buyers are willing to buy the 100,000 bottles only if the price is 50¢ a bottle, so the price remains at 50¢ a bottle. The tax reduces the price received by sellers to 45¢ a bottle, and sellers pay the entire tax.

**Perfectly Elastic Supply** Figure 6.9(b) shows the market for sand from which computer-chip makers extract silicon. Supply of this sand is perfectly elastic at a price of 10¢ a pound, as shown by the supply curve $S$. The demand curve for sand is $D$. With no tax, the price is 10¢ a pound and 5,000 pounds a week are bought.

If this sand is taxed at 1¢ a pound, we must add the tax to the minimum supply-price. Sellers are now willing to offer any quantity at 11¢ a pound along the curve $S + \text{tax}$. A new equilibrium is determined where the new supply curve intersects the demand curve: at a price of 11¢ a pound and a quantity of 3,000 pounds a week. The tax has increased the price buyers pay by the full amount of the tax—1¢ a pound—and has decreased the quantity sold. Buyers pay the entire tax.

We’ve seen that when supply is perfectly inelastic, sellers pay the entire tax, and when supply is perfectly elastic, buyers pay the entire tax. In the usual case, supply is neither perfectly inelastic nor perfectly elastic and the tax is split between buyers and sellers. But how the tax is split depends on the elasticity of supply: The more elastic the supply, the larger is the amount of the tax paid by buyers.
Taxes and Efficiency

A tax drives a wedge between the buying price and the selling price and results in inefficient underproduction. The price buyers pay is also the buyers’ willingness to pay, which measures *marginal social benefit*. The price sellers receive is also the sellers’ minimum supply-price, which equals *marginal social cost*.

A tax makes marginal social benefit exceed marginal social cost, shrinks the producer surplus and consumer surplus, and creates a deadweight loss.

Figure 6.10 shows the inefficiency of a tax on MP3 players. The demand curve, $D$, shows marginal social benefit, and the supply curve, $S$, shows marginal social cost. Without a tax, the market produces the efficient quantity (5,000 players a week).

With a tax, the sellers’ minimum supply-price rises by the amount of the tax and the supply curve shifts to $S + \text{tax}$. This supply curve does *not* show marginal social cost. The tax component isn’t a *social cost of*...

**FIGURE 6.9 Tax and the Elasticity of Supply**

(a) Perfectly inelastic supply

(b) Perfectly elastic supply

Part (a) shows the market for water from a mineral spring. Supply is perfectly inelastic. With no tax, the price is 50¢ a bottle. With a tax of 5¢ a bottle, the price remains at 50¢ a bottle. The number of bottles bought remains the same, but the price received by sellers decreases to 45¢ a bottle. Sellers pay the entire tax.

Part (b) shows the market for sand. Supply is perfectly elastic. With no tax, the price is 10¢ a pound. A tax of 1¢ a pound increases the minimum supply-price to 11¢ a pound. The supply curve shifts to $S + \text{tax}$. The price increases to 11¢ a pound. Buyers pay the entire tax.

**FIGURE 6.10 Taxes and Efficiency**

With no tax, 5,000 players a week are produced. With a $20 tax, the buyers’ price rises to $210, the sellers’ price falls to $190, and the quantity decreases to 4,000 players a week. Consumer surplus shrinks to the green area, and the producer surplus shrinks to the blue area. Part of the loss of consumer surplus and producer surplus goes to the government as tax revenue (the purple area) and part becomes a deadweight loss (the gray area).
production. It is a transfer of resources to the government. At the new equilibrium quantity (4,000 players a week), both consumer surplus and producer surplus shrink. Part of each surplus goes to the government in tax revenue—the purple area; part becomes a deadweight loss—the gray area.

Only in the extreme cases of perfectly inelastic demand and perfectly inelastic supply does a tax not change the quantity bought and sold so that no deadweight loss arises.

**Taxes and Fairness**

We’ve examined the incidence and the efficiency of taxes. But when political leaders debate tax issues, it is fairness, not incidence and efficiency, that gets the most attention. Democrats complain that Republican tax cuts are unfair because they give the benefits of lower taxes to the rich. Republicans counter that it is fair that the rich get most of the tax cuts because they pay most of the taxes. No easy answers are available to the questions about the fairness of taxes.

Economists have proposed two conflicting principles of fairness to apply to a tax system:

- The benefits principle
- The ability-to-pay principle

**The Benefits Principle** The *benefits principle* is the proposition that people should pay taxes equal to the benefits they receive from the services provided by government. This arrangement is fair because it means that those who benefit most pay the most taxes. It makes tax payments and the consumption of government-provided services similar to private consumption expenditures.

The benefits principle can justify high fuel taxes to pay for freeways, high taxes on alcoholic beverages and tobacco products to pay for public health-care services, and high rates of income tax on high incomes to pay for the benefits from law and order and from living in a secure environment, from which the rich might benefit more than the poor.

**The Ability-to-Pay Principle** The *ability-to-pay principle* is the proposition that people should pay taxes according to how easily they can bear the burden of the tax. A rich person can more easily bear the burden than a poor person can, so the ability-to-pay principle can reinforce the benefits principle to justify high rates of income tax on high incomes.

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**Economics in Action**

**Workers and Consumers Pay the Most Tax**

Because the elasticity of the supply of labor is low and the elasticity of demand for labor is high, workers pay most of the personal income taxes and most of the Social Security taxes. Because the elasticities of demand for alcohol, tobacco, and gasoline are low and the elasticities of supply are high, the burden of these taxes (excise taxes) falls more heavily on buyers than on sellers.

**U.S. Taxes**

Source of data: Budget of the United States Government, Fiscal Year 2012, Historical Tables, Table 2.2.

**REVIEW QUIZ**

1. How does the elasticity of demand influence the incidence of a tax, the tax revenue, and the deadweight loss?
2. How does the elasticity of supply influence the incidence of a tax, the quantity bought, the tax revenue, and the deadweight loss?
3. Why is a tax inefficient?
4. When would a tax be efficient?
5. What are the two principles of fairness that are applied to tax systems?

You can work these questions in Study Plan 6.3 and get instant feedback. **MyEconLab**

Your next task is to study production quotas and subsidies, tools that are used to influence the markets for farm products.
Production Quotas and Subsidies

An early or late frost, a hot dry summer, and a wet spring present just a few of the challenges that fill the lives of farmers with uncertainty and sometimes with economic hardship. Fluctuations in the weather bring fluctuations in farm output and prices and sometimes leave farmers with low incomes. To help farmers avoid low prices and low incomes, governments intervene in the markets for farm products.

Price floors that work a bit like the minimum wage that you’ve already studied might be used. But as you’ve seen, this type of government action creates a surplus and is inefficient. These same conclusions apply to the effects of a price floor for farm products.

Governments often use two other methods of intervention in the markets for farm products:

- Production quotas
- Subsidies

Production Quotas

In the markets for sugarbeets, tobacco leaf, and cotton (among others), governments have, from time to time, imposed production quotas. A **production quota** is an upper limit to the quantity of a good that may be produced in a specified period. To discover the effects of a production quota, let’s look at what a quota does to the market for sugarbeets.

Suppose that the growers of sugarbeets want to limit total production to get a higher price. They persuade the government to introduce a production quota on sugarbeets.

The effect of the production quota depends on whether it is set below or above the equilibrium quantity. If the government introduced a production quota above the equilibrium quantity, nothing would change because sugarbeet growers would already be producing less than the quota. But a production quota set **below the equilibrium quantity** has big effects, which are

- A decrease in supply
- A rise in price
- A decrease in marginal cost
- Inefficient underproduction
- An incentive to cheat and overproduce

Figure 6.11 illustrates these effects.

FIGURE 6.11  The Effects of a Production Quota

With no quota, growers produce 60 million tons a year and the price is $30 a ton. A production quota of 40 million tons a year restricts total production to that amount. The quantity produced decreases to 40 million tons a year, the price rises to $50 a ton, and the farmers’ marginal cost falls to $20 a ton. Because marginal social cost (on the supply curve) is less than marginal social benefit (on the demand curve), a deadweight loss arises from the underproduction.

**A Decrease in Supply**  A production quota on sugarbeets decreases the supply of sugarbeets. Each grower is assigned a production limit that is less than the amount that would be produced—and supplied—without the quota. The total of the growers’ limits equals the quota, and any production in excess of the quota is illegal.

The quantity supplied becomes the amount permitted by the production quota, and this quantity is fixed. The supply of sugarbeets becomes perfectly inelastic at the quantity permitted under the quota.

In Fig. 6.11, with no quota, growers would produce 60 million tons of sugarbeets a year—the market equilibrium quantity. With a production quota set at 40 million tons a year, the gray-shaded area shows the illegal region. As in the case of price ceilings and price floors, market forces and political forces are in conflict in this illegal region.

The vertical red line labeled “Quota” becomes the supply curve of sugarbeets at prices above $20 a ton.
**A Rise in Price** The production quota raises the price of sugarbeets. When the government sets a production quota, it leaves market forces free to determine the price. Because the quota decreases the supply of sugarbeets, it raises the price. In Fig. 6.11, with no quota, the price is $30 a ton. With a quota of 40 million tons, the price rises to $50 a ton.

**A Decrease in Marginal Cost** The production quota lowers the marginal cost of growing sugarbeets. Marginal cost decreases because growers produce less and stop using the resources with the highest marginal cost. Sugarbeet growers slide down their supply (and marginal cost) curves. In Fig. 6.11, marginal cost decreases to $20 a ton.

**Inefficiency** The production quota results in inefficient underproduction. Marginal social benefit at the quantity produced is equal to the market price, which has increased. Marginal social cost at the quantity produced has decreased and is less than the market price. So marginal social benefit exceeds marginal social cost and a deadweight loss arises.

**An Incentive to Cheat and Overproduce** The production quota creates an incentive for growers to cheat and produce more than their individual production limit. With the quota, the price exceeds marginal cost, so the grower can get a larger profit by producing one more unit. Of course, if all growers produce more than their assigned limit, the production quota becomes ineffective, and the price falls to the equilibrium (no quota) price.

To make the production quota effective, growers must set up a monitoring system to ensure that no one cheats and overproduces. But it is costly to set up and operate a monitoring system and it is difficult to detect and punish producers who violate their quotas.

Because of the difficulty of operating a quota, producers often lobby governments to establish a quota and provide the monitoring and punishment systems that make it work.

**Subsidies** In the United States, the producers of peanuts, sugarbeets, milk, wheat, and many other farm products receive subsidies. A subsidy is a payment made by the government to a producer. A large and controversial Farm Bill passed by Congress in 2008 renewed and extended a wide range of subsidies.

The effects of a subsidy are similar to the effects of a tax but they go in the opposite directions. These effects are:
- An increase in supply
- A fall in price and increase in quantity produced
- An increase in marginal cost
- Payments by government to farmers
- Inefficient overproduction

Figure 6.12 illustrates the effects of a subsidy to peanut farmers.

**An Increase in Supply** In Fig. 6.12, with no subsidy, the demand curve $D$ and the supply curve $S$ determine the price of peanuts at $40$ a ton and the quantity of peanuts at $40$ million tons a year.

Suppose that the government introduces a subsidy of $20$ a ton to peanut farmers. A subsidy is like a negative tax. A tax is equivalent to an increase in cost, so a subsidy is equivalent to a decrease in cost. The subsidy brings an increase in supply.

To determine the position of the new supply curve, we subtract the subsidy from the farmers’ minimum supply-price. In Fig. 6.12, with no subsidy, farmers are willing to offer $40$ million tons a year at a price of $40$ a ton. With a subsidy of $20$ a ton, they will offer $40$ million tons a year if the price is as low as $20$ a ton. The supply curve shifts to the red curve labeled $S - \text{subsidy}$.

**A Fall in Price and Increase in Quantity Produced** The subsidy lowers the price of peanuts and increases the quantity produced. In Fig. 6.12, equilibrium occurs where the new supply curve intersects the demand curve at a price of $30$ a ton and a quantity of $60$ million tons a year.

**An Increase in Marginal Cost** The subsidy lowers the price paid by consumers but increases the marginal cost of producing peanuts. Marginal cost increases because farmers grow more peanuts, which means that they must begin to use some resources that are less ideal for growing peanuts. Peanut farmers slide up their supply (and marginal cost) curves. In Fig. 6.12, marginal cost increases to $50$ a ton.

**Payments by Government to Farmers** The government pays a subsidy to peanut farmers on each ton of peanuts produced. In this example, farmers increase production to $60$ million tons a year and receive a
subsidy of $20 a ton. So peanut farmers receive payments from the government that total $1,200 million a year.

**Inefficient Overproduction** The subsidy results in inefficient overproduction. At the quantity produced with the subsidy, marginal social benefit is equal to the market price, which has fallen. Marginal social cost has increased and it exceeds the market price. Because marginal social cost exceeds marginal social benefit, the increased production brings inefficiency.

Subsidies spill over to the rest of the world. Because a subsidy lowers the domestic market price, subsidized farmers will offer some of their output for sale on the world market. The increase in supply on the world market lowers the price in the rest of the world. Faced with lower prices, farmers in other countries decrease production and receive smaller revenues.

**Economics in Action**

**Rich High-Cost Farmers the Winners**

Farm subsidies are a major obstacle to achieving an efficient use of resources in the global markets for farm products and are a source of tension between the United States, Europe, and developing nations.

The United States and the European Union are the world’s two largest and richest economies. They also pay their farmers the biggest subsidies, which create inefficient overproduction of food in these rich economies.

At the same time, U.S. and European subsidies make it more difficult for farmers in the developing nations of Africa, Asia, and Central and South America to compete in global food markets. Farmers in these countries can often produce at a lower opportunity cost than the U.S. and European farmers.

Two rich countries, Australia and New Zealand, have stopped subsidizing farmers. The result has been an improvement in the efficiency of farming in these countries. New Zealand is so efficient at producing lamb and dairy products that it has been called the Saudi Arabia of milk (an analogy with Saudi Arabia’s huge oil reserve and production.)

International opposition to U.S. and European farm subsidies is strong. Opposition to farm subsidies inside the United States and Europe is growing, but it isn’t as strong as the pro-farm lobby, so don’t expect an early end to these subsidies.

**REVIEW QUIZ**

1. Summarize the effects of a production quota on the market price and the quantity produced.
2. Explain why a production quota is inefficient.
3. Explain why a voluntary production quota is difficult to operate.
4. Summarize the effects of a subsidy on the market price and the quantity produced.
5. Explain why a subsidy is inefficient.

You can work these questions in Study Plan 6.4 and get instant feedback. MyEconLab

Governments intervene in some markets by making it illegal to trade in a good. Let’s now see how these markets work.
Markets for Illegal Goods

The markets for many goods and services are regulated, and buying and selling some goods is illegal. The best-known examples of such goods are drugs, such as marijuana, cocaine, ecstasy, and heroin. Despite the fact that these drugs are illegal, trade in them is a multibillion-dollar business. This trade can be understood by using the same economic model and principles that explain trade in legal goods. To study the market for illegal goods, we’re first going to examine the prices and quantities that would prevail if these goods were not illegal. Next, we’ll see how prohibition works. Then we’ll see how a tax might be used to limit the consumption of these goods.

A Free Market for a Drug

Figure 6.13 shows the market for a drug. The demand curve, \( D \), shows that, other things remaining the same, the lower the price of the drug, the larger is the quantity of the drug demanded. The supply curve, \( S \), shows that, other things remaining the same, the lower the price of the drug, the smaller is the quantity supplied. If the drug were not illegal, the quantity bought and sold would be \( Q_C \) and the price would be \( P_C \).

A Market for an Illegal Drug

When a good is illegal, the cost of trading in the good increases. By how much the cost increases and who bears the cost depend on the penalties for violating the law and the degree to which the law is enforced. The larger the penalties and the better the policing, the higher are the costs. Penalties might be imposed on sellers, buyers, or both.

Penalties on Sellers  Drug dealers in the United States face large penalties if their activities are detected. For example, a marijuana dealer could pay a $200,000 fine and serve a 15-year prison term. A heroin dealer could pay a $500,000 fine and serve a 20-year prison term. These penalties are part of the cost of supplying illegal drugs, and they bring a decrease in supply—a leftward shift in the supply curve. To determine the new supply curve, we add the cost of breaking the law to the minimum price that drug dealers are willing to accept. In Fig. 6.13, the cost of breaking the law by selling drugs (\( CBL \)) is added to the minimum price that dealers will accept and the supply curve shifts leftward to \( S + CBL \). If penalties were imposed only on sellers, the market equilibrium would move from point \( E \) to point \( F \).

Penalties on Buyers  In the United States, it is illegal to possess drugs such as marijuana, cocaine, ecstasy, and heroin. Possession of marijuana can bring a prison term of 1 year, and possession of heroin can bring a prison term of 2 years. Penalties fall on buyers, and the cost of breaking the law must be subtracted from the value of the good to determine the maximum price buyers are willing to pay for the drugs. Demand decreases, and the demand curve shifts leftward. In Fig. 6.13, the demand...
Markets for Illegal Goods

Illegal Trading to Evade the Tax  It is likely that an extremely high tax rate would be needed to cut the quantity of drugs bought to the level prevailing with a prohibition. It is also likely that many drug dealers and consumers would try to cover up their activities to evade the tax. If they did act in this way, they would face the cost of breaking the law—the tax law. If the penalty for tax law violation is as severe and as effectively policed as drug-dealing laws, the analysis we’ve already conducted applies also to this case. The quantity of drugs bought would depend on the penalties for law breaking and on the way in which the penalties are assigned to buyers and sellers.

Penalties on Both Sellers and Buyers  If penalties are imposed on both sellers and buyers, both supply and demand decrease and both the supply curve and the demand curve shift. In Fig. 6.13, the costs of breaking the law are the same for both buyers and sellers, so both curves shift leftward by the same amount. The market equilibrium moves to point $H$. The market price remains at the competitive market price $P_C$, but the quantity bought decreases to $Q_B$. Buyers pay $P_C$ plus the cost of breaking the law, which equals $P_B$. Sellers receive $P_C$ minus the cost of breaking the law, which equals $P_S$.

The larger the penalties and the greater the degree of law enforcement, the larger is the decrease in demand and/or supply. If the penalties are heavier on sellers, the supply curve shifts farther than the demand curve and the market price rises above $P_C$. If the penalties are heavier on buyers, the demand curve shifts farther than the supply curve and the market price falls below $P_C$. In the United States, the penalties on sellers are larger than those on buyers, so the quantity of drugs traded decreases and the market price increases compared with a free market.

With high enough penalties and effective law enforcement, it is possible to decrease demand and/or supply to the point at which the quantity bought is zero. But in reality, such an outcome is unusual. It does not happen in the United States in the case of illegal drugs. The key reason is the high cost of law enforcement and insufficient resources for the police to achieve effective enforcement. Because of this situation, some people suggest that drugs (and other illegal goods) should be legalized and sold openly but also taxed at a high rate in the same way that legal drugs such as alcohol are taxed. How would such an arrangement work?

Legalizing and Taxing Drugs

From your study of the effects of taxes, it is easy to see that the quantity bought of a drug could be decreased if the drug was legalized and taxed. Imposing a sufficiently high tax could decrease the supply, raise the price, and achieve the same decrease in the quantity bought as does a prohibition on drugs. The government would collect a large tax revenue.

Taxes Versus Prohibition: Some Pros and Cons

Which is more effective: prohibition or taxes? In favor of taxes and against prohibition is the fact that the tax revenue can be used to make law enforcement more effective. It can also be used to run a more effective education campaign against illegal drug use. In favor of prohibition and against taxes is the fact that prohibition sends a signal that might influence preferences, decreasing the demand for illegal drugs. Also, some people intensely dislike the idea of the government profiting from trade in harmful substances.

**REVIEW QUIZ**

1. How does the imposition of a penalty for selling an illegal drug influence demand, supply, price, and the quantity of the drug consumed?
2. How does the imposition of a penalty for possessing an illegal drug influence demand, supply, price, and the quantity of the drug consumed?
3. How does the imposition of a penalty for selling or possessing an illegal drug influence demand, supply, price, and the quantity of the drug consumed?
4. Is there any case for legalizing drugs?

You can work these questions in Study Plan 6.5 and get instant feedback.

You now know how to use the demand and supply model to predict prices, to study government actions in markets, and to study the sources and costs of inefficiency. In *Reading Between the Lines* on pp. 144–145, you will see how to apply what you’ve learned by looking at the effects of the minimum wage in the Buffalo–Niagara region labor market.
Push to Raise the Minimum Wage

Push Is On for Higher Minimum Wage

Buffalo News
February 5, 2012

Remember those signs you’d see when you walked into Mighty Taco and other stores a few years ago—before the recession hit—offering entry-level jobs that paid a few dimes more than minimum wage?

You don’t see many of those signs these days. Then again, the job market is a lot different, too.

Back in the day, when unemployment in the Buffalo–Niagara region was under 5 percent, businesses that rely on minimum wage workers regularly had to sweeten the pot a little to find both the quantity—and quality—of employees they needed to fill their entry-level jobs.

Now, with the economy still moving in fits and starts, local unemployment is just under 8 percent and there are almost 17,000 more people without jobs in the Buffalo–Niagara region than there were five years ago. …

It’s a matter of supply and demand. Before the recession, even minimum wage workers had a little leverage. Now, when it comes to pay, employers are in more of a position to tell new hires to take it or leave it.

It’s against that backdrop that Assembly Speaker Sheldon Silver, D-Manhattan, is proposing to boost the state’s minimum wage by $1.25 an hour, or 17 percent, to $8.50 an hour beginning next year. He also wants the minimum wage, which last increased in 2009, to be adjusted each year, beginning in 2014, to keep pace with inflation. …

Would a higher minimum wage break the bank of employers? No. But it might make them cut back, either by hiring fewer part-time workers or giving them fewer hours.

And that’s the problem with raising the minimum wage right now, when market forces are keeping a lid on wages across the board and jobs are in short supply.

ESSENCE OF THE STORY

- Before the recession (in 2007) when the unemployment rate was less than 5 percent, firms paid above the minimum wage to fill entry-level jobs.
- In 2012, with an unemployment rate close to 8 percent, employers can hire workers at the minimum wage.
- Sheldon Silver wants to increase the New York State minimum wage by $1.25 an hour to $8.50 an hour and then to adjust it each year to keep pace with inflation.
- A higher minimum wage might make employers hire fewer workers or hire a worker for fewer hours.
The news article describes the labor market in New York State in two periods with different outcomes and different consequences of the state’s minimum wage law.

On January 1, 2007, the New York minimum wage rate was increased from $6.75 to $7.15 an hour.

In 2007, the U.S. economy was booming and the unemployment rate in New York was less than 5 percent, a level at which it is easy for workers to find jobs and hard for employers to fill job vacancies.

When the minimum wage rate was set at $7.15 an hour, it had no effect on employers because they already found it necessary to pay a higher wage to attract the quantity of labor demanded.

Figure 1 illustrates the Buffalo–Niagara region labor market in 2007.

The supply of labor curve is $S$, the demand for labor curve is $D_{07}$, and the equilibrium wage rate is $7.25$ an hour.

With the equilibrium wage rate greater than the minimum wage rate, the quantity of labor demanded equals the quantity of labor supplied and the minimum wage rate has no effect on the market outcome.

In 2008 and with effects lasting into 2012, the U.S. economy was hit by a global financial crisis and slump in production and jobs.

The demand for labor decreased and the equilibrium wage rate fell.

During this period, in July 2009, the New York state minimum wage rate increased to $7.25 an hour.

With a fall in the equilibrium wage rate and a rise in the minimum wage rate, the quantity of labor supplied exceeded the quantity of labor demanded and unemployment increased.

The news article says that 17,000 more people were without jobs in the Buffalo–Niagara region in 2012 than five years earlier.

Figure 2 illustrates the Buffalo–Niagara region labor market in 2012.

The supply of labor curve is $S$, but the demand for labor curve is now $D_{12}$. The equilibrium wage rate is $6.75$ per hour (an assumption).

With the equilibrium wage rate less than the minimum wage rate, the quantity of labor demanded is less than the quantity of labor supplied and the minimum wage rate brings an increase in unemployment.
SUMMARY

Key Points

A Housing Market with a Rent Ceiling (pp. 128–130)
- A rent ceiling that is set above the equilibrium rent has no effect.
- A rent ceiling that is set below the equilibrium rent creates a housing shortage, increased search activity, and a black market.
- A rent ceiling that is set below the equilibrium rent is inefficient and unfair.

Working Problems 1 to 6 will give you a better understanding of a housing market with a rent ceiling.

A Labor Market with a Minimum Wage (pp. 131–135)
- A minimum wage set below the equilibrium wage rate has no effect.
- A minimum wage set above the equilibrium wage rate creates unemployment and increases the amount of time people spend searching for a job.
- A minimum wage set above the equilibrium wage rate is inefficient, unfair, and hits low-skilled young people hardest.

Working Problems 7 to 12 will give you a better understanding of a labor market with a minimum wage.

Taxes (pp. 133–138)
- A tax raises the price paid by buyers, but usually by less than the tax.
- The elasticity of demand and the elasticity of supply determine the share of a tax paid by buyers and sellers.
- The less elastic the demand or the more elastic the supply, the larger is the share of the tax paid by buyers.
- If demand is perfectly elastic or supply is perfectly inelastic, sellers pay the entire tax. And if demand is perfectly inelastic or supply is perfectly elastic, buyers pay the entire tax.

Working Problems 13 to 15 will give you a better understanding of taxes.

Production Quotas and Subsidies (pp. 139–141)
- A production quota leads to inefficient underproduction, which raises the price.
- A subsidy is like a negative tax. It lowers the price, increases the cost of production, and leads to inefficient overproduction.

Working Problems 16 and 17 will give you a better understanding of production quotas and subsidies.

Markets for Illegal Goods (pp. 142–143)
- Penalties on sellers increase the cost of selling the good and decrease the supply of the good.
- Penalties on buyers decrease their willingness to pay and decrease the demand for the good.
- Penalties on buyers and sellers decrease the quantity of the good, raise the price buyers pay, and lower the price sellers receive.
- Legalizing and taxing can achieve the same outcome as penalties on buyers and sellers.

Working Problem 18 will give you a better understanding of markets for illegal goods.

Key Terms

Black market, 128
Minimum wage, 131
Price cap, 128
Price ceiling, 128
Price floor, 131
Production quota, 139
Rent ceiling, 128
Search activity, 128
Subsidy, 140
Tax incidence, 133
5. Draw a graph to illustrate the effects of a price ceiling set below the equilibrium price in the market for gasoline.

6. Explain the various ways in which a price ceiling on gasoline that is set below the equilibrium price would make buyers and sellers of gasoline better off or worse off. What would happen to total surplus and deadweight loss in this market?

A Labor Market with a Minimum Wage
(Study Plan 6.2)

Use the following data to work Problems 7 to 9.
The table gives the demand and supply schedules of teenage labor.

<table>
<thead>
<tr>
<th>Wage rate (dollars per hour)</th>
<th>Quantity demanded (hours per month)</th>
<th>Quantity supplied (hours per month)</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>3,000</td>
<td>1,000</td>
</tr>
<tr>
<td>5</td>
<td>2,500</td>
<td>1,500</td>
</tr>
<tr>
<td>6</td>
<td>2,000</td>
<td>2,000</td>
</tr>
<tr>
<td>7</td>
<td>1,500</td>
<td>2,500</td>
</tr>
<tr>
<td>8</td>
<td>1,000</td>
<td>3,000</td>
</tr>
</tbody>
</table>

7. Calculate the equilibrium wage rate, the number of hours worked, and the quantity of unemployment.

8. If a minimum wage for teenagers is set at $5 an hour, how many hours do they work and how many hours of teenage labor are unemployed?

9. If a minimum wage for teenagers is set at $7 an hour,
   a. How many hours do teenagers work and how many hours are unemployed?
   b. Demand for teenage labor increases by 500 hours a month. What is the wage rate paid to teenagers and how many hours of teenage labor are unemployed?

Use the following news clip to work Problems 10 to 12.

India Steps Up Pressure for Minimum Wage for Its Workers in the Gulf

Oil-rich countries in the [Persian] Gulf, already confronted by strong labor protests, are facing renewed pressure from India to pay minimum wages for unskilled workers. With five million immigrant workers in the region, India is trying to win better conditions for their citizens.

Source: International Herald Tribune, March 27, 2008
Suppose that the Gulf countries paid a minimum wage above the equilibrium wage to Indian workers.

10. How would the market for labor be affected in the Gulf countries? Draw a supply and demand graph to illustrate your answer.

11. How would the market for labor be affected in India? Draw a supply and demand graph to illustrate your answer. [Be careful: the minimum wage is in the Gulf countries, not in India.]

12. Would migrant Indian workers be better off or worse off or unaffected by this minimum wage?

**Taxes** (Study Plan 6.3)

13. The table gives the demand and supply schedules for chocolate brownies.

<table>
<thead>
<tr>
<th>Price (cents per brownie)</th>
<th>Quantity demanded (millions per day)</th>
<th>Quantity supplied (millions per day)</th>
</tr>
</thead>
<tbody>
<tr>
<td>50</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>60</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>70</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>80</td>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>90</td>
<td>1</td>
<td>7</td>
</tr>
</tbody>
</table>

a. If brownies are not taxed, what is the price of a brownie and how many are bought?
b. If sellers are taxed 20¢ a brownie, what is the price? How many are sold? Who pays the tax?
c. If buyers are taxed 20¢ a brownie, what is the price? How many are bought? Who pays the tax?

14. **Will Cuts on China’s Luxury Goods Tax Prevent Chinese from Buying Abroad?**

Last year Chinese tourists bought almost two-thirds of luxury goods sold in Europe. If you look at China’s luxury goods tax, it is easy to see why shopping overseas is so popular. According to the Chinese Ministry of Commerce, prices for luxury goods in China are 45% higher than in Hong Kong, 51% higher than the United States, and 72% higher than France.

Source: PRLog, March 21, 2012

a. Explain why it is “easy to see why shopping overseas is so popular” with wealthy Chinese shoppers.
b. Who pays most of the Chinese luxury tax: sellers or buyers? Explain your answer.
c. Explain how a cut in China’s luxury tax rate will change the quantity of luxury goods purchased in China.

15. **How to Take a Gas Holiday**

High fuel prices will probably keep Americans closer to home this summer, despite the gas-tax “holiday” that would shave 18¢ off every gallon.

Source: *Time*, May 19, 2008

Would the price of gasoline that consumers pay fall by 18¢ a gallon? How would consumer surplus change? Explain your answers.

**Production Quotas and Subsidies** (Study Plan 6.4)

Use the following data to work Problems 16 and 17. The demand and supply schedules for rice are

<table>
<thead>
<tr>
<th>Price (dollars per box)</th>
<th>Quantity demanded (boxes per week)</th>
<th>Quantity supplied (boxes per week)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.20</td>
<td>3,000</td>
<td>1,500</td>
</tr>
<tr>
<td>1.30</td>
<td>2,750</td>
<td>2,000</td>
</tr>
<tr>
<td>1.40</td>
<td>2,500</td>
<td>2,500</td>
</tr>
<tr>
<td>1.50</td>
<td>2,250</td>
<td>3,000</td>
</tr>
<tr>
<td>1.60</td>
<td>2,000</td>
<td>3,500</td>
</tr>
</tbody>
</table>

16. Calculate the price, the marginal cost of rice, and the quantity produced if the government sets a production quota of 2,000 boxes a week.

17. Calculate the price, the marginal cost of rice, and the quantity produced if the government introduces a subsidy of $0.30 a box.

**Markets for Illegal Goods** (Study Plan 6.5)

18. The figure illustrates the market for a banned substance.

Calculate the market price and the quantity consumed if a penalty of $20 a unit is imposed on

a. Sellers only.
b. Buyers only.
c. Both sellers and buyers.
b. Would a cut in the Social Security tax that small businesses pay offset the effect of the higher minimum wage on employment? Explain.

24. The demand and supply schedules for tulips are

<table>
<thead>
<tr>
<th>Price (dollars per bunch)</th>
<th>Quantity demanded (bunches per week)</th>
<th>Quantity supplied (bunches per week)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>100</td>
<td>40</td>
</tr>
<tr>
<td>12</td>
<td>90</td>
<td>60</td>
</tr>
<tr>
<td>14</td>
<td>80</td>
<td>80</td>
</tr>
<tr>
<td>16</td>
<td>70</td>
<td>100</td>
</tr>
<tr>
<td>18</td>
<td>60</td>
<td>120</td>
</tr>
</tbody>
</table>

a. If tulips are not taxed, what is the price and how many bunches are bought?
b. If tulips are taxed $6 a bunch, what are the price and quantity bought? Who pays the tax?


New York City has the highest cigarette taxes in the country. During the four months following the recent tax hike, sales of taxed cigarettes in the city fell by more than 50 percent as consumers turned to the city’s bustling black market. The thriving illegal market for cigarettes has diverted billions of dollars from legitimate businesses and governments to criminals.

Source: Cato Institute, February 6, 2003

a. How has the market for cigarettes in New York City responded to the high cigarette taxes?
b. How does the emergence of a black market impact the elasticity of demand in a legal market?
c. Why might an increase in the tax rate actually cause a decrease in the tax revenue?

26. a. Why are U.S. soybean farmers subsidized?

27. Use the following news clip to work Problems 26 to 28.

Crop Prices Erode Farm Subsidy Program

High corn and soybean prices mean farmers are making the most money in their lives. The reason: Grain prices are far too high to trigger payouts under the U.S. primary farm-subsidy program’s “price support” formula. The market has done what Congress couldn’t do and that is “slash farm subsidies.”


26. a. Why are U.S. soybean farmers subsidized?
b. Explain how a subsidy paid to soybean farmers affects the price of soybean and the marginal cost of producing it.

27. Show in a graph how a subsidy paid to soybean farmers affects the consumer surplus and the producer surplus from soybean. Does the subsidy make the soybean market more efficient or less efficient? Explain.

28. In the market for corn with a price support, explain why the corn price has risen and ended up being too high to "trigger payouts."

Markets for Illegal Goods

29. The table gives the demand and supply schedules for an illegal drug.

<table>
<thead>
<tr>
<th>Price (dollars per unit)</th>
<th>Quantity demanded (units per day)</th>
<th>Quantity supplied (units per day)</th>
</tr>
</thead>
<tbody>
<tr>
<td>50</td>
<td>500</td>
<td>300</td>
</tr>
<tr>
<td>60</td>
<td>400</td>
<td>400</td>
</tr>
<tr>
<td>70</td>
<td>300</td>
<td>500</td>
</tr>
<tr>
<td>80</td>
<td>200</td>
<td>600</td>
</tr>
<tr>
<td>90</td>
<td>100</td>
<td>700</td>
</tr>
</tbody>
</table>

a. If there are no penalties on buying or selling the drug, what is the price and how many units are consumed?
b. If the penalty on sellers is $20 a unit, what are the price and quantity consumed?
c. If the penalty on buyers is $20 a unit, what are the price and quantity consumed?

economics in the News

30. After you have studied Reading Between the Lines on pp. 144–145, answer the following questions.

a. Suppose the New York minimum wage rate had been raised to $7.25 an hour in 2007 and the demand for and supply of labor were as shown in Fig. 1 on p. 145. Describe the situation in the Buffalo–Niagara region labor market.
b. How does Assembly Speaker Sheldon Silver want to change the New York minimum wage law?
c. How would Mr. Silver’s proposal change the minimum wage in 2013 and 2014 and how would you expect the labor market to be influenced by the changes you’ve described?
d. Draw a graph of the Buffalo–Niagara region labor market in 2014 to illustrate your answer to part (c).

31. Hollywood: Organized Crime Hits the Movies

The Mexican army seized 1,180 disc burners and 3.14 million copies of movies and TV shows from 23 warehouses in a move to fight piracy that costs Hollywood about $590 million a year.

Source: Bloomberg Businessweek, April 7, 2011

Assume that the marginal cost of producing a DVD (legal or illegal) is a constant $3 and that legal DVDs bear an additional marginal cost of $5 each in royalty payments to film studios.

a. Draw a graph of the market for counterfeit DVDs, assuming that there are no effective penalties on either buyers or sellers for breaking the law.
b. How do the events reported in the news clip change the market outcome? Show the effects in your graph.
c. With no penalty on buyers, if a penalty for breaking the law is imposed on sellers at more than $5 a disc, how does the market work and what is the equilibrium price?
d. With no penalty on sellers, if a penalty for breaking the law is imposed on buyers at more than $5 a disc, how does the market work and what is the equilibrium price?
e. What is the marginal benefit of an illegal DVD in the situations described in parts (c) and (d)?
f. In light of your answer to part (e), why does law enforcement usually focus on sellers rather than buyers?

32. Drivers Feel the Pinch as Diesel Hits $4 a Gallon

“The high price of gasoline is hurting our economy,” said Mark Kirsch, a trucker, who organized a rally in Washington. “It’s hurting middle-class people.”


Explain to truck drivers why a cap on the price of gasoline would hurt middle-class people more than the high price of gasoline hurts.

33. On December 31, 1776, Rhode Island established wage controls to limit wages to 70¢ a day for carpenters and 42¢ a day for tailors.

a. Are these wage controls a price ceiling or a price floor? Why might they have been introduced?
b. If these wage controls are effective, would you expect to see a surplus or a shortage of carpenters and tailors?
iPhones, Wii games, and Nike shoes are just three of the items that you might buy that are not produced in the United States. They are produced abroad in Asia and manufactured by workers who earn a fraction of what an American worker earns.

Isn’t globalization of production killing good American jobs? How can we compete with people whose wages are a fraction of our own? Why do we go to such lengths to trade and communicate with others in faraway places?

You will find some answers in this chapter. And in Reading Between the Lines at the end of the chapter, you can apply what you’ve learned and examine the effects of a tariff that the Obama government has put on solar panels imported from China.

After studying this chapter, you will be able to:

- Explain how markets work with international trade
- Identify the gains from international trade and its winners and losers
- Explain the effects of international trade barriers
- Explain and evaluate arguments used to justify restricting international trade
CHAPTER 7 Global Markets in Action

This same principle applies to trade among nations. Because China has a comparative advantage at producing T-shirts and the United States has a comparative advantage at producing airplanes, the people of both countries can gain from specialization and trade. China can buy airplanes from the United States at a lower opportunity cost than that at which Chinese firms can produce them. And Americans can buy T-shirts from China for a lower opportunity cost than that at which U.S. firms can produce them. Also, through international trade, Chinese producers can get higher prices for their T-shirts and Boeing can sell airplanes for a higher price. Both countries gain from international trade.

Let’s now illustrate the gains from trade that we’ve just described by studying demand and supply in the global markets for T-shirts and airplanes.
Why the United States Imports T-Shirts

The United States imports T-shirts because the rest of the world has a comparative advantage in producing T-shirts. Figure 7.1 illustrates how this comparative advantage generates international trade and how trade affects the price of a T-shirt and the quantities produced and bought.

The demand curve $D_{US}$ and the supply curve $S_{US}$ show the demand and supply in the U.S. domestic market only. The demand curve tells us the quantity of T-shirts that Americans are willing to buy at various prices. The supply curve tells us the quantity of T-shirts that U.S. garment makers are willing to sell at various prices—that is, the quantity supplied at each price when all T-shirts sold in the United States are produced in the United States.

Figure 7.1(a) shows what the U.S. T-shirt market would be like with no international trade. The price of a shirt would be $8 and 40 million shirts a year would be produced by U.S. garment makers and bought by U.S. consumers.

Figure 7.1(b) shows the market for T-shirts with international trade. Now the price of a T-shirt is determined in the world market, not the U.S. domestic market. The world price of a T-shirt is less than $8, which means that the rest of the world has a comparative advantage in producing T-shirts. The world price line shows the world price at $5 a shirt.

The U.S. demand curve, $D_{US}$, tells us that at $5 a shirt, Americans buy 60 million shirts a year. The U.S. supply curve, $S_{US}$, tells us that at $5 a shirt, U.S. garment makers produce 20 million T-shirts a year. To buy 60 million T-shirts when only 20 million are produced in the United States, we must import T-shirts from the rest of the world. The quantity of T-shirts imported is 40 million a year.

FIGURE 7.1 A Market with Imports

(a) Equilibrium with no international trade

Part (a) shows the U.S. market for T-shirts with no international trade. The U.S. domestic demand curve $D_{US}$ and U.S. domestic supply curve $S_{US}$ determine the price of a T-shirt at $8 and the quantity of T-shirts produced and bought in the United States at 40 million a year.

Part (b) shows the U.S. market for T-shirts with international trade. World demand for and world supply of T-shirts determine the world price of a T-shirt, which is $5. The price in the U.S. market falls to $5 a shirt. U.S. purchases of T-shirts increase to 60 million a year, and U.S. production of T-shirts decreases to 20 million a year. The United States imports 40 million T-shirts a year.

MyEconLab animation
**Why the United States Exports Airplanes**

Figure 7.2 illustrates international trade in airplanes. The demand curve $D_{US}$ and the supply curve $S_{US}$ show the demand and supply in the U.S. domestic market only. The demand curve tells us the quantity of airplanes that U.S. airlines are willing to buy at various prices. The supply curve tells us the quantity of airplanes that U.S. aircraft makers are willing to sell at various prices.

Figure 7.2(a) shows what the U.S. airplane market would be like with no international trade. The price of an airplane would be $100 million and 400 airplanes a year would be produced by U.S. aircraft makers and bought by U.S. airlines.

Figure 7.2(b) shows the U.S. airplane market with international trade. Now the price of an airplane is determined in the world market and the world price is higher than $100 million, which means that the United States has a comparative advantage in producing airplanes. The world price line shows the world price at $150 million.

The U.S. demand curve, $D_{US}$, tells us that at $150 million an airplane, U.S. airlines buy 200 airplanes a year. The U.S. supply curve, $S_{US}$, tells us that at $150 million an airplane, U.S. aircraft makers produce 700 airplanes a year. The quantity produced in the United States (700 a year) minus the quantity purchased by U.S. airlines (200 a year) is the quantity of airplanes exported, which is 500 airplanes a year.

**REVIEW QUIZ**

1. Describe the situation in the market for a good or service that the United States imports.
2. Describe the situation in the market for a good or service that the United States exports.

You can work these questions in Study Plan 7.1 and get instant feedback.  

---

**FIGURE 7.2** A Market with Exports

(a) Equilibrium without international trade

In part (a), the U.S. market with no international trade, the U.S. domestic demand curve $D_{US}$ and the U.S. domestic supply curve $S_{US}$ determine the price of an airplane at $100 million and 400 airplanes are produced and bought each year.

In part (b), the U.S. market with international trade,

(b) Equilibrium in a market with exports

world demand and world supply determine the world price, which is $150 million per airplane. The price in the U.S. market rises. U.S. airplane production increases to 700 a year, and U.S. purchases of airplanes decrease to 200 a year. The United States exports 500 airplanes a year.
Winners, Losers, and the Net Gain from Trade

In Chapter 1 (see pp. 6–7), we asked whether globalization is in the self-interest of the low-wage worker in Malaysia who sews your new running shoes and the shoemaker in Atlanta—whether it is in the social interest. We’re now going to answer these questions. You will learn why producers complain about cheap foreign imports, but consumers of imports never complain.

Gains and Losses from Imports

We measure the gains and losses from imports by examining their effect on consumer surplus, producer surplus, and total surplus. In the importing country the winners are those whose surplus increases and the losers are those whose surplus decreases.

Figure 7.3(a) shows what consumer surplus and producer surplus would be with no international trade in T-shirts. U.S. domestic demand, $D_{US}$, and U.S. domestic supply, $S_{US}$, determine the price and quantity. The green area shows consumer surplus and the blue area shows producer surplus. Total surplus is the sum of consumer surplus and producer surplus.

Figure 7.3(b) shows how these surpluses change when the U.S. market opens to imports. The U.S. price falls to the world price. The quantity bought increases to the quantity demanded at the world price and consumer surplus expands from $A$ to the larger green area $A + B + D$. The quantity produced in the United States decreases to the quantity supplied at the world price and producer surplus shrinks to the smaller blue area $C$.

Part of the gain in consumer surplus, the area $B$, is a loss of producer surplus—a redistribution of total surplus. But the other part of the increase in consumer surplus, the area $D$, is a net gain. This increase in total surplus results from the lower price and increased purchases and is the gain from imports.

FIGURE 7.3 Gains and Losses in a Market with Imports

(a) Consumer surplus and producer surplus with no international trade

In part (a), with no international trade, the green area shows the consumer surplus and the blue area shows the producer surplus.

In part (b), with international trade, the price falls to the world price of $5 a shirt. Consumer surplus expands from area $A$ to the area $A + B + D$. Producer surplus shrinks to area $C$. Area $B$ is a transfer of surplus from producers to consumers. Area $D$ is an increase in total surplus—the gain from imports.
Gains and Losses from Exports

We measure the gains and losses from exports just like we measured those from imports, by their effect on consumer surplus, producer surplus, and total surplus.

Figure 7.4(a) shows the situation with no international trade. Domestic demand, $D_{US}$, and domestic supply, $S_{US}$, determine the price and quantity, the consumer surplus, and the producer surplus.

Figure 7.4(b) shows how the consumer surplus and producer surplus change when the good is exported. The price rises to the world price. The quantity bought decreases to the quantity demanded at the world price and the consumer surplus shrinks to the green area $A$. The quantity produced increases to the quantity supplied at the world price and the producer surplus expands to the blue area $B + C + D$.

Part of the gain in producer surplus, the area $B$, is a loss in consumer surplus—a redistribution of the total surplus. But the other part of the increase in producer surplus, the area $D$, is a net gain. This increase in total surplus results from the higher price and increased production and is the gain from exports.

Gains for All

You’ve seen that both imports and exports bring gains. Because one country’s exports are other countries’ imports, international trade brings gain for all countries. International trade is a win-win game.

REVIEW QUIZ

1. How is the gain from imports distributed between consumers and domestic producers?
2. How is the gain from exports distributed between consumers and domestic producers?
3. Why is the net gain from international trade positive?

You can work these questions in Study Plan 7.2 and get instant feedback.

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(a) Consumer surplus and producer surplus with no international trade

In part (a), the U.S. market with no international trade, the green area shows the consumer surplus and the blue area shows the producer surplus. In part (b), the U.S. market with international trade, the price rises to the world price.

(b) Gains and losses from exports

Consumer surplus shrinks to area $A$. Producer surplus expands from area $C$ to the area $B + C + D$. Area $B$ is a transfer of surplus from consumers to producers. Area $D$ is an increase in total surplus—the gain from exports.
International Trade Restrictions

Governments use four sets of tools to influence international trade and protect domestic industries from foreign competition. They are

- Tariffs
- Import quotas
- Other import barriers
- Export subsidies

Tariffs

A tariff is a tax on a good that is imposed by the importing country when an imported good crosses its international boundary. For example, the government of India imposes a 100 percent tariff on wine imported from California. So when an Indian imports a $10 bottle of Californian wine, he pays the Indian government a $10 import duty.

Tariffs raise revenue for governments and serve the self-interest of people who earn their incomes in import-competing industries. But as you will see, restrictions on free international trade decrease the gains from trade and are not in the social interest.

The Effects of a Tariff

To see the effects of a tariff, let’s return to the example in which the United States imports T-shirts. With free trade, the T-shirts are imported and sold at the world price. Then, under pressure from U.S. garment makers, the U.S. government imposes a tariff on imported T-shirts. Buyers of T-shirts must now pay the world price plus the tariff. Several consequences follow and Fig. 7.5 illustrates them.

Figure 7.5(a) shows the situation with free international trade. The United States produces 20 million T-shirts a year and imports 40 million a year at the world price of $5 a shirt. Figure 7.5(b) shows what happens with a tariff set at $2 per T-shirt.

Tariffs with free trade

The world price of a T-shirt is $5. With free trade in part (a), Americans buy 60 million T-shirts a year. U.S. garment makers produce 20 million T-shirts a year and the United States imports 40 million a year.

With a tariff of $2 per T-shirt in part (b), the price in

FIGURE 7.5 The Effects of a Tariff

MyEconLab animation
The following changes occur in the market for T-shirts:

- The price of a T-shirt in the United States rises by $2.
- The quantity of T-shirts bought in the United States decreases.
- The quantity of T-shirts produced in the United States increases.
- The quantity of T-shirts imported into the United States decreases.
- The U.S. government collects a tariff revenue.

**Rise in Price of a T-Shirt** To buy a T-shirt, Americans must pay the world price plus the tariff, so the price of a T-shirt rises by the $2 tariff to $7. Figure 7.5(b) shows the new domestic price line, which lies $2 above the world price line. The price rises by the full amount of the tariff. The buyer pays the entire tariff because supply from the rest of the world is perfectly elastic (see Chapter 6, p. 137).

**Decrease in Purchases** The higher price of a T-shirt brings a decrease in the quantity demanded along the demand curve. Figure 7.5(b) shows the decrease from 60 million T-shirts a year at $5 a shirt to 45 million a year at $7 a shirt.

**Increase in Domestic Production** The higher price of a T-shirt stimulates domestic production, and U.S. garment makers increase the quantity supplied along the supply curve. Figure 7.5(b) shows the increase from 20 million T-shirts at $5 a shirt to 35 million a year at $7 a shirt.

**Decrease in Imports** T-shirt imports decrease by 30 million, from 40 million to 10 million a year. Both the decrease in purchases and the increase in domestic production contribute to this decrease in imports.

**Tariff Revenue** The government’s tariff revenue is $20 million—$2 per shirt on 10 million imported shirts—shown by the purple rectangle.

**Winners, Losers, and the Social Loss from a Tariff** A tariff on an imported good creates winners and losers and a social loss. When the U.S. government imposes a tariff on an imported good,

- U.S. consumers of the good lose.
- U.S. producers of the good gain.
- U.S. consumers lose more than U.S. producers gain.
- Society loses: a deadweight loss arises.

**U.S. Consumers of the Good Lose** Because the price of a T-shirt in the United States rises, the quantity of T-shirts demanded decreases. The combination of a higher price and smaller quantity bought decreases consumer surplus—the loss to U.S. consumers that arises from a tariff.

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**Economics in Action**

**U.S. Tariffs Almost Gone**

The Smoot-Hawley Act, which was passed in 1930, took U.S. tariffs to a peak average rate of 20 percent in 1933. (One third of imports was subject to a 60 percent tariff.) The General Agreement on Tariffs and Trade (GATT) was established in 1947. Since then tariffs have fallen in a series of negotiating rounds, the most significant of which are identified in the figure. Tariffs are now as low as they have ever been but import quotas and other trade barriers persist.
**U.S. Producers of the Good Gain** Because the price of an imported T-shirt rises by the amount of the tariff, U.S. T-shirt producers are now able to sell their T-shirts for the world price plus the tariff. At the higher price, the quantity of T-shirts supplied by U.S. producers increases. The combination of a higher price and larger quantity produced increases producer surplus—the gain to U.S. producers from the tariff.

**U.S. Consumers Lose More Than U.S. Producers Gain** Consumer surplus decreases for four reasons: Some becomes producer surplus, some is lost in a higher cost of production (domestic producers have higher costs than foreign producers), some is lost because imports decrease, and some goes to the government as tariff revenue. Figure 7.6 shows these sources of lost consumer surplus.

Figure 7.6(a) shows the consumer surplus and producer surplus with free international trade in T-shirts. Figure 7.6(b) shows the consumer surplus and producer surplus with a $2 tariff on imported T-shirts. By comparing Fig. 7.6(b) with Fig. 7.6(a), you can see how a tariff changes these surpluses.

**FIGURE 7.6 The Winners and Losers from a Tariff**

(a) Free trade

The world price of a T-shirt is $5. In part (a), with free trade, the United States imports 40 million T-shirts. Consumer surplus, producer surplus, and the gains from free trade are as large as possible.

In part (b), a tariff of $2 per T-shirt raises the U.S. price of a T-shirt to $7. The quantity imported decreases. Consumer surplus shrinks by the areas $B$, $C$, $D$, and $E$. Producer surplus expands by area $B$. The government’s tariff revenue is area $D$, and the tariff creates a deadweight loss equal to the area $C + E$. 

Consumer surplus—the green area—shrinks for four reasons. First, the higher price transfers surplus from consumers to producers. The blue area $B$ represents this loss (and gain of producer surplus). Second, domestic production costs more than imports. The supply curve $S_{US}$ shows the higher cost of production and the gray area $C$ shows this loss of consumer surplus. Third, some of the consumer surplus is transferred to the government. The purple area $D$ shows this loss (and gain of government revenue). Fourth, some of the consumer surplus is lost because imports decrease. The gray area $E$ shows this loss.

**Society Loses: A Deadweight Loss Arises** Some of the loss of consumer surplus is transferred to producers and some is transferred to the government and spent on government programs that people value. But the increase in production cost and the loss from decreased imports is transferred to no one: It is a social loss—a deadweight loss. The gray areas labeled $C$ and $E$ represent this deadweight loss. Total surplus decreases by the area $C + E$. 

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**MyEconLab animation**
Import Quotas

We now look at the second tool for restricting trade: import quotas. An **import quota** is a restriction that limits the maximum quantity of a good that may be imported in a given period.

Most countries impose import quotas on a wide range of items. The United States imposes them on food products such as sugar and bananas and manufactured goods such as textiles and paper.

Import quotas enable the government to satisfy the self-interest of the people who earn their incomes in the import-competing industries. But you will discover that like a tariff, an import quota decreases the gains from trade and is not in the social interest.

The Effects of an Import Quota The effects of an import quota are similar to those of a tariff. The price rises, the quantity bought decreases, and the quantity produced in the United States increases. Figure 7.7 illustrates the effects.

Figure 7.7(a) shows the situation with free international trade. Figure 7.7(b) shows what happens with an import quota of 10 million T-shirts a year. The U.S. supply curve of T-shirts becomes the domestic supply curve, $S_{US}$, plus the quantity that the import quota permits. So the supply curve becomes $S_{US} + \text{quota}$. The price of a T-shirt rises to $7, the quantity of T-shirts bought in the United States decreases to 45 million a year, the quantity of T-shirts produced in the United States increases to 35 million a year, and the quantity of T-shirts imported into the United States decreases to the quota quantity of 10 million a year. All the effects of this quota are identical to the effects of a $2 per shirt tariff, as you can check in Fig. 7.5(b).

**Winners, Losers, and the Social Loss from an Import Quota** An import quota creates winners and losers that are similar to those of a tariff but with an interesting difference.

---

**FIGURE 7.7 The Effects of an Import Quota**

(a) Free trade

With free international trade, in part (a), Americans buy 60 million T-shirts at the world price. The United States produces 20 million T-shirts and imports 40 million a year. With an import quota of 10 million T-shirts a year, in part (b),

(b) Market with import quota

the supply of T-shirts in the United States is shown by the curve $S_{US} + \text{quota}$. The price in the United States rises to $7 a T-shirt. U.S. production increases, U.S. purchases decrease, and the quantity of T-shirts imported decreases.
When the government imposes an import quota,

- U.S. consumers of the good lose.
- U.S. producers of the good gain.
- Importers of the good gain.
- Society loses: a deadweight loss arises.

Figure 7.8 shows these gains and losses from a quota. By comparing Fig. 7.8(b) with a quota and Fig. 7.8(a) with free trade, you can see how an import quota of 10 million T-shirts a year changes the consumer and producer surpluses.

Consumer surplus—the green area—shrinks. This decrease is the loss to consumers from the import quota. The decrease in consumer surplus is made up of four parts. First, some of the consumer surplus is transferred to producers. The blue area $B$ represents this loss of consumer surplus (and gain of producer surplus). Second, part of the consumer surplus is lost because the domestic cost of production is higher than the world price. The gray area $C$ represents this loss. Third, part of the consumer surplus is transferred to importers who buy T-shirts for $5$ (the world price) and sell them for $7$ (the U.S. domestic price). The two blue areas $D$ represent this loss of consumer surplus and profit for importers. Fourth, part of the consumer surplus is lost because imports decrease. The gray area $E$ represents this loss.

The loss of consumer surplus from the higher cost of production and the decrease in imports is a social loss—a deadweight loss. The gray areas labeled $C$ and $E$ represent this deadweight loss. Total surplus decreases by the area $C + E$.

You can now see the one difference between a quota and a tariff. A tariff brings in revenue for the government while a quota brings a profit for the importers. All the other effects are the same, provided the quota is set at the same quantity of imports that results from the tariff.

**FIGURE 7.8** The Winners and Losers from an Import Quota

(a) Free trade

The world price of a T-shirt is $5. In part (a), with free trade, the United States produces 20 million T-shirts a year and imports 40 million T-shirts. Consumer surplus, producer surplus, and the gain from free international trade (darker green area) are as large as possible.

(b) Market with import quota

In part (b), the import quota raises the price of a T-shirt to $7. The quantity imported decreases. Consumer surplus shrinks by the areas $B$, $C$, $D$, and $E$. Producer surplus expands by area $B$. Importers' profit is the two areas $D$, and the quota creates a deadweight loss equal to $C + E$. 

MyEconLab animation
**ECONOMICS IN THE NEWS**

**The Changing Market for Coat Hangers**

*Your Dry Cleaning Bill Is About to Get Worse*

The price of wire hangers is a big deal for a dry cleaner, and that price will rise when the Commerce Department puts a 21 percent tariff on hangers made in Vietnam. The tariff is in response to a wire-hanger export subsidy paid to producers in Vietnam.

*Source: CNN Money, June 4, 2012*

**SOME FACTS**

Albert J. Parkhouse invented the wire hanger in Jackson, Michigan, in 1903 and for almost 100 years, the United States produced and exported wire hangers. During the past 20 years, China and Vietnam have become the major lowest-cost producers.

**THE PROBLEM**

Explain why the United States has switched from exporting to importing wire hangers. Also explain the effects of the 21 percent tariff. Does Vietnam’s export subsidy make the tariff efficient? Illustrate your explanations with a graph.

**THE SOLUTION**

- Initially, the opportunity cost of producing a wire hanger was lower in the United States than in the rest of the world. The United States had a comparative advantage in producing wire hangers and exported them.
- Today, the opportunity cost of producing a wire hanger is lower in China and Vietnam than in the United States (and other countries). China and Vietnam have a comparative advantage in producing wire hangers, so the United States imports them.
- By imposing a 21 percent tariff on wire hangers, the price in the United States rises above the world price by this percentage.
- The higher price decreases the quantity of wire hangers demanded in the United States, increases the quantity that U.S. producers supply, and decreases U.S. imports of wire hangers.
- The figure illustrates the U.S. market for wire hangers. The demand curve $D_{US}$ and the supply curve $S_{US}$ are assumed not to change. The U.S. price with no international trade is 10 cents per hanger.

**U.S. Market for Wire Hangers**

- With a world price $PW_0$ of 12 cents a hanger, the United States had a comparative advantage in hangers, so it produced 7 million hangers a month, used 3 million, and exported 4 million. The figure shows the quantity of U.S. exports.
- When the world price falls to $PW_1$ at 5 cents a hanger, the United States stops producing hangers and imports 10 million a month.
- With a 21 percent tariff, the price in the United States rises to $PW_1 + \text{tariff}$. U.S. hanger production now becomes 1 million a month, the quantity used decreases to 9 million, and imports decrease to 8 million.
- The fact that the tariff is a response to Vietnam’s export subsidy does not make the tariff efficient. It creates a deadweight loss shown by the two gray triangles.
Other Import Barriers
Two sets of policies that influence imports are
- Health, safety, and regulation barriers
- Voluntary export restraints

Health, Safety, and Regulation Barriers  Thousands of detailed health, safety, and other regulations restrict international trade. For example, U.S. food imports are examined by the Food and Drug Administration to determine whether the food is “pure, wholesome, safe to eat, and produced under sanitary conditions.” The discovery of BSE (mad cow disease) in just one U.S. cow in 2003 was enough to close down international trade in U.S. beef. The European Union bans imports of most genetically modified foods, such as U.S.-produced soybeans. Although regulations of the type we’ve just described are not designed to limit international trade, they have that effect.

Voluntary Export Restraints  A voluntary export restraint is like a quota allocated to a foreign exporter of a good. This type of trade barrier isn’t common. It was initially used during the 1980s when Japan voluntarily limited its exports of car parts to the United States.

Export Subsidies
A subsidy is a payment by the government to a producer. You studied the effects of a subsidy on the quantity produced and the price of a subsidized farm product in Chapter 6, pp. 140–141.

An export subsidy is a payment by the government to the producer of an exported good. Export subsidies are illegal under a number of international agreements, including the North American Free Trade Agreement (NAFTA), and the rules of the World Trade Organization (WTO).

Although export subsidies are illegal, the subsidies that the U.S. and European Union governments pay to farmers end up increasing domestic production, some of which gets exported. These exports of subsidized farm products make it harder for producers in other countries, notably in Africa and Central and South America, to compete in global markets. Export subsidies bring gains to domestic producers, but they result in inefficient underproduction in the rest of the world and create a deadweight loss.

Economics in Action
Self-Interest Beats the Social Interest

The World Trade Organization (WTO) is an international body established by the world’s major trading nations for the purpose of supervising international trade and lowering the barriers to trade.

In 2001, at a meeting of trade ministers from all the WTO member-countries held in Doha, Qatar, an agreement was made to begin negotiations to lower tariff barriers and quotas that restrict international trade in farm products and services. These negotiations are called the Doha Development Agenda or the Doha Round.

In the period since 2001, thousands of hours of conferences in Cancún in 2003, Geneva in 2004, and Hong Kong in 2005, and ongoing meetings at WTO headquarters in Geneva, costing millions of taxpayers’ dollars, have made disappointing progress.

Rich nations, led by the United States, the European Union, and Japan, want greater access to the markets of developing nations in exchange for allowing those nations greater access to the markets of the rich world, especially those for farm products.

Developing nations, led by Brazil, China, India, and South Africa, want access to the markets of farm products of the rich world, but they also want to protect their infant industries.

With two incompatible positions, these negotiations are stalled and show no signs of a breakthrough. The self-interests of rich nations and developing nations are preventing the achievement of the social interest.

REVIEW QUIZ
1 What are the tools that a country can use to restrict international trade?
2 Explain the effects of a tariff on domestic production, the quantity bought, and the price.
3 Explain who gains and who loses from a tariff and why the losses exceed the gains.
4 Explain the effects of an import quota on domestic production, consumption, and price.
5 Explain who gains and who loses from an import quota and why the losses exceed the gains.

You can work these questions in Study Plan 7.3 and get instant feedback. MyEconLab
The Case Against Protection

You’ve just seen that free trade promotes prosperity and protection is inefficient. Yet trade is restricted with tariffs, quotas, and other barriers. Why? Seven arguments for trade restrictions are that protecting domestic industries from foreign competition:

- Helps an infant industry grow
- Counteracts dumping
- Saves domestic jobs
- Allows us to compete with cheap foreign labor
- Penalizes lax environmental standards
- Prevents rich countries from exploiting developing countries
- Reduces offshore outsourcing that sends good U.S. jobs to other countries

Helps an Infant Industry Grow

Comparative advantages change with on-the-job experience—learning-by-doing. When a new industry or a new product is born—an infant industry—it is not as productive as it will become with experience. It is argued that such an industry should be protected from international competition until it can stand alone and compete.

It is true that learning-by-doing can change comparative advantage, but this fact doesn’t justify protecting an infant industry. Firms anticipate and benefit from learning-by-doing without protection from foreign competition.

When Boeing started to build airplanes, productivity was at first low. But after a period of learning-by-doing, huge productivity gains followed. Boeing didn’t need a tariff to achieve these productivity gains.

Counteracts Dumping

Dumping occurs when a foreign firm sells its exports at a lower price than its cost of production. Dumping might be used by a firm that wants to gain a global monopoly. In this case, the foreign firm sells its output at a price below its cost to drive domestic firms out of business. When the domestic firms have gone, the foreign firm takes advantage of its monopoly position and charges a higher price for its product. Dumping is illegal under the rules of the World Trade Organization and is usually regarded as a justification for temporary tariffs, which are called countervailing duties.

But it is virtually impossible to detect dumping because it is hard to determine a firm’s costs. As a result, the test for dumping is whether a firm’s export price is below its domestic price. But this test is weak because it is rational for a firm to charge a low price in a market in which the quantity demanded is highly sensitive to price and a higher price in a market in which demand is less price-sensitive.

Saves Domestic Jobs

First, free trade does destroy some jobs, but it also creates other jobs. It brings about a global rationalization of labor and allocates labor resources to their highest-valued activities. International trade in textiles has cost tens of thousands of U.S. jobs as U.S. textile mills and other factories closed. But tens of thousands of jobs have been created in other countries as textile mills opened. And tens of thousands of U.S. workers have better-paying jobs than as textile workers because U.S. export industries have expanded and created new jobs. More jobs have been created than destroyed.

Although protection can save particular jobs, it does so at a high cost. For example, until 2005, U.S. textile jobs were protected by an international agreement called the Multifiber Arrangement. The U.S. International Trade Commission (ITC) has estimated that because of import quotas, 72,000 jobs existed in the textile industry that would otherwise have disappeared and that the annual clothing expenditure in the United States was $15.9 billion ($160 per family) higher than it would have been with free trade. Equivalently, the ITC estimated that each textile job saved cost $221,000 a year.

Imports don’t only destroy jobs. They create jobs for retailers that sell imported goods and for firms that service those goods. Imports also create jobs by creating income in the rest of the world, some of which is spent on U.S.-made goods and services.

Allows Us to Compete with Cheap Foreign Labor

With the removal of tariffs on trade between the United States and Mexico, people said we would hear a “giant sucking sound” as jobs rushed to Mexico. That didn’t happen. Why?

Because low-wage labor is low-productivity labor. If a U.S. autoworker earns $30 an hour and produces 15 units of output an hour, the average labor cost of a
Reduces Offshore Outsourcing that Sends Good U.S. Jobs to Other Countries

Offshore outsourcing—buying goods, components, or services from firms in other countries—brings gains from trade identical to those of any other type of trade. We could easily change the names of the items traded from T-shirts and airplanes (the examples in the previous sections of this chapter) to banking services and call center services (or any other pair of services). A U.S. bank might export banking services to Indian firms, and Indians might provide call center services to U.S. firms. This type of trade would benefit both Americans and Indians, provided the United States has a comparative advantage in banking services and India has a comparative advantage in call center services.

Despite the gain from specialization and trade that offshore outsourcing brings, many people believe that it also brings costs that eat up the gains. Why?

A major reason is that it seems to send good U.S. jobs to other countries. It is true that some manufacturing and service jobs are going overseas. But others are expanding at home. The United States imports call center services, but it exports education, health care, legal, financial, and a host of other types of services. The number of jobs in these sectors is expanding and will continue to expand.

The exact number of jobs that have moved to lower-cost offshore locations is not known, and estimates vary. But even the highest estimate is small compared to the normal rate of job creation and labor turnover.

Gains from trade do not bring gains for every single person. Americans, on average, gain from offshore outsourcing, but some people lose. The losers are those who have invested in the human capital to do a specific job that has now gone offshore.

Unemployment benefits provide short-term temporary relief for these displaced workers. But the long-term solution requires retraining and the acquisition of new skills.

Beyond bringing short-term relief through unemployment benefits, government has a larger role to play. By providing education and training, it can enable the labor force of the twenty-first century to engage in the ongoing learning and sometimes rapid retooling that jobs we can’t foresee today will demand.

Schools, colleges, and universities will expand and become better at doing their job of producing a more highly educated and flexible labor force.
CHAPTER 7 Global Markets in Action

Why Is International Trade Restricted?

Why, despite all the arguments against protection, is trade restricted? There are two key reasons:

- **Tariff revenue**: Government revenue is costly to collect. In developed countries such as the United States, a well-organized tax collection system is in place that can generate billions of dollars of income tax and sales tax revenues. But governments in developing countries have a difficult time collecting taxes from their citizens. Much economic activity takes place in an informal economy with few financial records. The one area in which economic transactions are well recorded is international trade. So tariffs on international trade are a convenient source of revenue in these countries.

- **Rent seeking**: It is time to stop rewarding businesses that ship jobs overseas, and start rewarding companies that create jobs right here in America.”

A survey conducted in 2004 found that 69 percent of Americans think outsourcing hurts the U.S. economy and only 17 percent think it helps.

Avoiding Trade Wars

We have reviewed the arguments commonly heard in favor of protection and the counterarguments against it. But one counterargument to protection that is general and quite overwhelming is that protection invites retaliation and can trigger a trade war.

A trade war is a contest in which when one country raises its import tariffs, other countries retaliate with increases of their own, which trigger yet further increases from the first country.

A trade war occurred during the Great Depression of the 1930s when the United States introduced the Smoot-Hawley tariff. Country after country retaliated with its own tariff, and in a short period, world trade had almost disappeared. The costs to all countries were large and led to a renewed international resolve to avoid such self-defeating moves in the future. The costs also led to attempts to liberalize trade following World War II.

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**Rent seeking**: It is time to stop rewarding businesses that ship jobs overseas, and start rewarding companies that create jobs right here in America.”

A survey conducted in 2004 found that 69 percent of Americans think outsourcing hurts the U.S. economy and only 17 percent think it helps.
Rent Seeking Rent seeking is the major reason why international trade is restricted. Rent seeking is lobbying for special treatment by the government to create economic profit or to divert consumer surplus or producer surplus away from others. Free trade increases consumption possibilities on average, but not everyone shares in the gain and some people even lose. Free trade brings benefits to some and imposes costs on others, with total benefits exceeding total costs. The uneven distribution of costs and benefits is the principal obstacle to achieving more liberal international trade.

Returning to the example of trade in T-shirts and airplanes, the benefits from free trade accrue to all the producers of airplanes and to those producers of T-shirts that do not bear the costs of adjusting to a smaller garment industry. These costs are transition costs, not permanent costs. The costs of moving to free trade are borne by the garment producers and their employees who must become producers of other goods and services in which the United States has a comparative advantage.

The number of winners from free trade is large, but because the gains are spread thinly over a large number of people, the gain per person is small. The winners could organize and become a political force lobbying for free trade. But political activity is costly. It uses time and other scarce resources and the gains per person are too small to make the cost of political activity worth bearing.

In contrast, the number of losers from free trade is small, but the loss per person is large. Because the loss per person is large, the people who lose are willing to incur considerable expense to lobby against free trade.

Both the winners and losers weigh benefits and costs. Those who gain from free trade weigh the benefits it brings against the cost of achieving it. Those who lose from free trade and gain from protection weigh the benefit of protection against the cost of maintaining it. The protectionists undertake a larger quantity of political lobbying than the free traders.

Compensating Losers

If, in total, the gains from free international trade exceed the losses, why don’t those who gain compensate those who lose so that everyone is in favor of free trade?

Some compensation does take place. When Congress approved the North American Free Trade Agreement (NAFTA) with Canada and Mexico, it set up a $56 million fund to support and retrain workers who lost their jobs as a result of the new trade agreement. During NAFTA’s first six months, only 5,000 workers applied for benefits under this scheme. The losers from international trade are also compensated indirectly through the normal unemployment compensation arrangements. But only limited attempts are made to compensate those who lose.

The main reason why full compensation is not attempted is that the costs of identifying all the losers and estimating the value of their losses would be enormous. Also, it would never be clear whether a person who has fallen on hard times is suffering because of free trade or for other reasons that might be largely under her or his control. Furthermore, some people who look like losers at one point in time might, in fact, end up gaining. The young autoworker who loses his job in Michigan and becomes a computer assembly worker in Minneapolis might resent the loss of work and the need to move. But a year later, looking back on events, he counts himself fortunate.

Because we do not, in general, compensate the losers from free international trade, protectionism is a popular and permanent feature of our national economic and political life.
A Tariff on Solar Panels

U.S. Proposes Anti-Dumping Duty on Chinese Solar Cell Imports

The U.S. department of commerce has proposed antidumping duties on imports of Chinese solar cells, raising the threat of a trade dispute and dividing the American solar industry over the decision.

The proposed tariffs for dumping—selling at less than fair value—are about 31 percent for 61 named Chinese suppliers, and about 250 percent for other imports from China.

The decision follows a collapse in prices for solar components caused by global manufacturing overcapacity after aggressive expansion, particularly in China.

The result has been good news for companies seeking to supply solar power to homes or the grid, making them more competitive against fossil fuels, but has crushed margins for panel manufacturers and made it hard for higher-cost U.S. producers to compete. The U.S. commerce department’s decision is subject to confirmation in October and a final determination from the U.S. International Trade Commission.

The department said that as “critical circumstances exist,” it would instruct U.S. Customs to start requiring cash deposits or bonds to the value of the duties for all imports of Chinese solar cells starting from 90 days ago.

The action follows an antidumping complaint from SolarWorld, a German company that manufactures in the United States, and six other companies. . .

The pressure on U.S. solar manufacturing has been politically difficult for President Barack Obama’s administration, which has repeatedly stressed the opportunities for job creation in renewable energy.
As the world strives to replace carbon-emitting power stations with renewable energy sources, solar panels have become more popular and the cost of producing a solar panel has fallen.

Solar panels are produced in the United States, China, and many other countries.

Today, U.S. producers are struggling to compete with Chinese producers and have persuaded the U.S. government to protect them with a 30 percent tariff.

Assume that initially, all the solar panels installed in the United States were manufactured here.

Figure 1 shows this situation. The demand curve is $D_{US}$ and the supply curve is $S_{US}$. The world price ($PW_0$) is $200 per panel, which equals the U.S. price with no trade. The quantity of solar panels demanded equals the quantity supplied at 4,000 units a week.

As Chinese firms enter the market for solar panels, the world price falls to $170 per panel ($PW_1$).

U.S. producers cannot compete, so they cut production to 1,000 units a week. Units installed increase to 5,000 a week and 4,000 a week are imported.

Some producer surplus is transferred to consumer surplus and total surplus increases (the dark green area).

Figure 2 shows the effect of a punitive tariff of 30 percent. A punitive tariff is one that makes it impossible for the foreign producer to compete.

When the tariff is imposed, the price in the United States rises to $200 per panel.

At this price, the quantity of solar panels produced in the United States increases by 3,000 units a week, the quantity installed decreases by 1,000 units a week, and imports are completely squeezed out.

U.S. producers of solar panels are happy because producer surplus increases (the blue area).

U.S. consumers and installers of solar panels lose and their loss exceeds the gain in producer surplus. The gray triangle shows the deadweight loss created.

Because the tariff eliminates imports, the U.S. government collects no tariff revenue.

A situation similar to that shown in Fig. 2 is present in the markets for the other items with a punitive tariff mentioned in the news article.

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**Figure 1** China Enters Solar Panel Market

**Figure 2** U.S. Puts Tariff on Solar Panel Imports
CHAPTER 7 Global Markets in Action

International Trade Restrictions (pp. 157–163)
- Countries restrict international trade by imposing tariffs, import quotas, and other import barriers.
- Trade restrictions raise the domestic price of imported goods, lower the quantity imported, decrease consumer surplus, increase producer surplus, and create a deadweight loss.

Working Problems 9 to 20 will give you a better understanding of international trade restrictions.

The Case Against Protection (pp. 164–167)
- Arguments that protection helps infant industry to grow and counteracts dumping are weak.
- Arguments that protection saves jobs, allows us to compete with cheap foreign labor, is needed to penalize lax environmental standards, and prevents exploitation of developing countries are flawed.
- Offshore outsourcing is just a new way of reaping gains from trade and does not justify protection.
- Trade restrictions are popular because protection brings a small loss per person to a large number of people and a large gain per person to a small number of people. Those who gain have a stronger political voice than those who lose and it is too costly to identify and compensate losers.

Working Problem 21 will give you a better understanding of the case against protection.

Key Points

How Global Markets Work (pp. 152–154)
- Comparative advantage drives international trade.
- If the world price of a good is lower than the domestic price, the rest of the world has a comparative advantage in producing that good and the domestic country gains by producing less, consuming more, and importing the good.
- If the world price of a good is higher than the domestic price, the domestic country has a comparative advantage in producing that good and gains by producing more, consuming less, and exporting the good.

Working Problems 1 to 6 will give you a better understanding of how global markets work.

Winners, Losers, and the Net Gain from Trade (pp. 155–156)
- Compared to a no-trade situation, in a market with imports, consumer surplus is larger, producer surplus is smaller, and total surplus is larger with free international trade.
- Compared to a no-trade situation, in a market with exports, consumer surplus is smaller, producer surplus is larger, and total surplus is larger with free international trade.

Working Problems 7 and 8 will give you a better understanding of winners, losers, and the net gains from trade.

Key Terms

Doha Development Agenda (Doha Round), 163
Dumping, 164
Exports, 152
General Agreement on Tariffs and Trade (GATT), 158
Import quota, 160
Imports, 152
Offshore outsourcing, 165
Rent seeking, 167
Tariff, 157
World Trade Organization (WTO), 163
How Global Markets Work (Study Plan 7.1)

Use the following information to work Problems 1 to 3.

Wholesalers of roses (the firms that supply your local flower shop with roses for Valentine’s Day) buy and sell roses in containers that hold 120 stems. The table provides information about the wholesale market for roses in the United States. The demand schedule is the wholesalers’ demand and the supply schedule is the U.S. rose growers’ supply.

<table>
<thead>
<tr>
<th>Price (dollars per container)</th>
<th>Quantity demanded (millions of containers per year)</th>
<th>Quantity supplied (millions of containers per year)</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>15</td>
<td>0</td>
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Wholesalers can buy roses at auction in Aalsmeer, Holland, for $125 per container.

1. a. Without international trade, what would be the price of a container of roses and how many containers of roses a year would be bought and sold in the United States?
   b. At the price in your answer to part (a), does the United States or the rest of the world have a comparative advantage in producing roses?

2. If U.S. wholesalers buy roses at the lowest possible price, how many do they buy from U.S. growers and how many do they import?

3. Draw a graph to illustrate the U.S. wholesale market for roses. Show the equilibrium in that market with no international trade and the equilibrium with free trade. Mark the quantity of roses produced in the United States, the quantity imported, and the total quantity bought.

Use the following news clip to work Problems 4 and 5.

Underwater Oil Discovery to Transform Brazil into a Major Exporter

A huge underwater oil field discovered late last year has the potential to transform Brazil into a sizable exporter. Fifty years ago, Petrobras was formed as a trading company to import oil to support Brazil’s growing economy. Two years ago, Brazil reached its long-sought goal of energy self-sufficiency.


4. Describe Brazil’s comparative advantage in producing oil and explain why its comparative advantage has changed.

5. a. Draw a graph to illustrate the Brazilian market for oil and explain why Brazil was an importer of oil until a few years ago.
   b. Draw a graph to illustrate the Brazilian market for oil and explain why Brazil may become an exporter of oil in the near future.

6. The End of Cheap Chinese Goods

Beginning in the 1990s, as China emerged as a major exporter, the prices of many goods fell. For example, clothing prices fell through 2007 when they bottomed out. But as China’s labor costs started to rise, clothing production moved from China to other countries.


a. Explain why China emerged as a major exporter of clothing through 2007.
   b. Explain why cheap Chinese goods are disappearing. Explain why China no longer exports cheap clothing.

Winners, Losers, and the Net Gain from Trade

(Study Plan 7.2)

7. In the news clip in Problem 6, who will gain and who will lose from the trade in goods that the news clip predicts?

8. Use the information on the U.S. wholesale market for roses in Problem 1 to
   a. Explain who gains and who loses from free international trade in roses compared to a situation in which Americans buy only roses grown in the United States.
   b. Draw a graph to illustrate the gains and losses from free trade.
   c. Calculate the gain from international trade.
CHAPTER 7  Global Markets in Action

International Trade Restrictions (Study Plan 7.3)

Use the following news clip to work Problems 9 and 10.

Steel Tariffs Appear to Have Backfired on Bush

President Bush set aside his free-trade principles last year and imposed heavy tariffs on imported steel to help out struggling mills in Pennsylvania and West Virginia. Some economists say the tariffs may have cost more jobs than they saved, by driving up costs for automakers and other steel users.


9. a. Explain how a high tariff on steel imports can help domestic steel producers.
    b. Explain how a high tariff on steel imports can harm steel users.

10. Draw a graph of the U.S. market for steel to show how a high tariff on steel imports
    i. Helps U.S. steel producers.
    ii. Harms U.S. steel users.
    iii. Creates a deadweight loss.

Use the information on the U.S. wholesale market for roses in Problem 11 to work Problems 11 to 16.

11. If the United States puts a tariff of $25 per container on imports of roses, explain how the U.S. price of roses, the quantity of roses bought, the quantity produced in the United States, and the quantity imported change.

12. Who gains and who loses from this tariff?

13. Draw a graph of the U.S. market for roses to illustrate the gains and losses from the tariff and on the graph identify the gains and losses, the tariff revenue, and the deadweight loss created.

14. If the United States puts an import quota on roses of 5 million containers, what happens to the U.S. price of roses, the quantity of roses bought, the quantity produced in the United States, and the quantity imported?

15. Who gains and who loses from this quota?

16. Draw a graph to illustrate the gains and losses from the import quota and on the graph identify the gains and losses, the importers’ profit, and the deadweight loss.

Use the following news clip to work Problems 17 and 18.

Car Sales Go Up as Prices Tumble

Car affordability in Australia is now at its best in 20 years, fueling a surge in sales as prices tumble. In 2000, Australia cut the tariff to 15 percent and on January 1, 2005, it cut the tariff to 10 percent.

Source: Courier Mail, February 26, 2005

17. Explain who gains and who loses from the lower tariff on imported cars.

18. Draw a graph to show how the price of a car, the quantity of cars bought, the quantity of cars produced in Australia, and the quantity of cars imported into Australia changed.

Use the following news clip to work Problems 19 and 20.

A New Food Crisis Is on Our Plates

Over the past year the price of corn has risen 52 percent, wheat 49 percent, and soybeans 28 percent. Alarmed at spiking food prices, a score of countries, including Russia and Ukraine, have banned food exports to make sure they can feed their own people first.

Source: Sydney Morning Herald, February 22, 2011

19. a. What are the benefits to a country from importing food?
    b. What costs might arise from relying on imported food?

20. If a country restricts food exports, what effect does this restriction have in that country on the price of food, the quantity of food it produces, the quantity of food it consumes, and the quantity of food it exports?

The Case Against Protection (Study Plan 7.4)

21. Chinese Tire Maker Rejects U.S. Charge of Defects

U.S. regulators ordered the recall of more than 450,000 faulty tires. The Chinese producer of the tires disputed the allegations and hinted that the recall might be an effort by foreign competitors to hamper Chinese exports to the United States. Mounting scrutiny of Chinese-made goods has become a source of new trade frictions between the United States and China and fueled worries among regulators, corporations, and consumers about the risks associated with many products imported from China.

Source: International Herald Tribune, June 26, 2007

a. What does the information in the news clip imply about the comparative advantage of producing tires in the United States and China?

b. Could product quality be a valid argument against free trade?

c. How would the product-quality argument against free trade be open to abuse by domestic producers of the imported good?
25. Act Now, Eat Later
The hunger crisis in poor countries has its roots in U.S. and European policies of subsidizing the diversion of food crops to produce biofuels like corn-based ethanol. That is, doling out subsidies to put the world’s dinner into the gas tank.

a. What is the effect on the world price of corn of the increased use of corn to produce ethanol in the United States and Europe?
b. How does the change in the world price of corn affect the quantity of corn produced in a poor developing country with a comparative advantage in producing corn, the quantity it consumes, and the quantity that it either exports or imports?

26. Draw a graph of the market for corn in the poor developing country in Problem 25(b) to show the changes in consumer surplus, producer surplus, and deadweight loss.

Use the following news clip to work Problems 27 and 28.

South Korea to Resume U.S. Beef Imports
South Korea will reopen its market to most U.S. beef. South Korea banned imports of U.S. beef in 2003 amid concerns over a case of mad cow disease in the United States. The ban closed what was then the third-largest market for U.S. beef exporters.

Source: CNN, May 29, 2008

27. a. Explain how South Korea’s import ban on U.S. beef affected beef producers and consumers in South Korea.
b. Draw a graph of the market for beef in South Korea to illustrate your answer to part (a). Identify the changes in consumer surplus, producer surplus, and deadweight loss that arise.

28. a. Assuming that South Korea is the only importer of U.S. beef, explain how South Korea’s import ban on U.S. beef affected beef producers and consumers in the United States.
b. Draw a graph of the market for beef in the United States to illustrate your answer to part (a). Identify the changes in consumer surplus, producer surplus, and deadweight loss.
CHAPTER 7 Global Markets in Action

International Trade Restrictions
Use the following information to work Problems 29 to 31.
Before 1995, trade between the United States and Mexico was subject to tariffs. In 1995, Mexico joined NAFTA and all U.S. and Mexican tariffs have gradually been removed.
29. Explain how the price that U.S. consumers pay for goods from Mexico and the quantity of U.S. imports from Mexico have changed. Who are the winners and who are the losers from this free trade?
30. Explain how the quantity of U.S. exports to Mexico and the U.S. government’s tariff revenue from trade with Mexico have changed.
31. Suppose that in 2013, tomato growers in Florida lobby the U.S. government to impose an import quota on Mexican tomatoes. Explain who in the United States would gain and who would lose from such a quota.

Economics in the News
37. After you have studied Reading Between the Lines on pp. 168–169, answer the following questions.
a. What events put U.S. solar panel producers under pressure?
b. Explain how a tariff on solar panel imports changes domestic production, consumption, and imports of solar panels.
c. Illustrate your answer to part (b) with an appropriate graphical analysis assuming that imports are not completely eliminated.
d. Explain how a tariff on solar panel imports changes consumer surplus and producer/union surplus.
e. Explain the four sources of loss of consumer surplus that result from a tariff on solar panel imports.
f. Illustrate your answer to part (e) with an appropriate graphical analysis.
38. Aid May Grow for Laid-Off Workers
Expansion of the Trade Adjustment Assistance (TAA) program would improve the social safety net for the 21st century, as advances permit more industries to take advantage of cheap foreign labor—even for skilled, white-collar work. By providing special compensation to more of globalization’s losers and retraining them for stable jobs at home, an expanded program could begin to ease the resentment and insecurity arising from the new economy.

The Case Against Protection
36. Trading Up
The cost of protecting jobs in uncompetitive sectors through tariffs is high: Saving a job in the sugar industry costs American consumers $826,000 in higher prices a year; saving a dairy industry job costs $685,000 per year; and saving a job in the manufacturing of women’s handbags costs $263,000.

a. What are the arguments for saving the jobs mentioned in this news clip?
b. Explain why these arguments are faulty.
c. Is there any merit to saving these jobs?
The Amazing Market

The five chapters that you’ve just studied explain how markets work. The market is an amazing instrument. It enables people who have never met and who know nothing about each other to interact and do business. It also enables us to allocate our scarce resources to the uses that we value most highly. Markets can be very simple or highly organized. Markets are ancient and they are modern.

A simple and ancient market is one that the American historian Daniel J. Boorstin describes in *The Discoverers* (p. 161). In the late fourteenth century,

> The Muslim caravans that went southward from Morocco across the Atlas Mountains arrived after twenty days at the shores of the Senegal River. There the Moroccan traders laid out separate piles of salt, of beads from Ceutian coral, and cheap manufactured goods. Then they retreated out of sight. The local tribesmen, who lived in the strip mines where they dug their gold, came to the shore and put a heap of gold beside each pile of Moroccan goods. Then they, in turn, went out of view, leaving the Moroccan traders either to take the gold offered for a particular pile or to reduce the pile of their merchandise to suit the offered price in gold. Once again the Moroccan traders withdrew, and the process went on. By this system of commercial etiquette, the Moroccans collected their gold.

Organized and modern markets are auctions on e-Bay and U.S. government auction of the airwaves that cell phone companies use. Susan Athey, whom you will meet on the following page, is a world-renowned expert on the design of auctions.

Everything and anything that can be exchanged is traded in markets to the benefit of both buyers and sellers.

Alfred Marshall (1842–1924) grew up in an England that was being transformed by the railroad and by the expansion of manufacturing. Mary Paley was one of Marshall’s students at Cambridge, and when Alfred and Mary married, in 1877, celibacy rules barred Alfred from continuing to teach at Cambridge. By 1884, with more liberal rules, the Marshalls returned to Cambridge, where Alfred became Professor of Political Economy.

Many economists had a hand in refining the demand and supply model, but the first thorough and complete statement of the model as we know it today was set out by Alfred Marshall, with the help of Mary Paley Marshall. Published in 1890, this monumental treatise, *The Principles of Economics*, became the textbook on economics on both sides of the Atlantic for almost half a century.
An important thing for an auction marketplace is to attract a good balance of buyers and sellers so that both the buyers and the sellers find it more profitable to transact in that marketplace rather than using some other mechanism. From a seller’s perspective, the more bidders there are on the platform, the greater the demand and the higher the prices. And from the buyer’s perspective, the more sellers there are on the platform, the greater the supply and the lower the prices.

Can we think of an auction as a mechanism for finding the equilibrium price and quantity?

Exactly. We can think of the whole collection of auctions on eBay as being a mechanism to discover a market clearing price, and individual items might sell a little higher or a little lower but over all we believe that the prices on eBay auctions will represent equilibrium prices.

Professor Athey, what sparked your interest in economics?

I was studying mathematics and computer science, but I felt that the subjects were not as relevant as I would like. I discovered economics through a research project with a professor who was working on auctions. I had a summer job working for a firm that sold computers to the government through auctions. Eventually my professor, Bob Marshall, wrote two articles on the topic and testified before Congress to help reform the system for government procurement of computers. That really inspired me and showed me the power of economic ideas to change the world and to make things work more efficiently.

What is the connection between an auction and the supply and demand model?

The basic laws of supply and demand can be seen in evidence in an auction market like eBay. The more sellers that are selling similar products, the lower the prices they can expect to achieve. Similarly the more buyers there are demanding those objects, the higher the prices the sellers can achieve.

An important thing for an auction marketplace is to attract a good balance of buyers and sellers so that both the buyers and the sellers find it more profitable to transact in that marketplace rather than using some other mechanism. From a seller’s perspective, the more bidders there are on the platform, the greater the demand and the higher the prices. And from the buyer’s perspective, the more sellers there are on the platform, the greater the supply and the lower the prices.

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*Read the full interview with Susan Athey in MyEconLab.
You want Adele’s album 21. Will you buy a CD for $9.99, or will you download it for $10.99? What determines our choices about how we buy recorded music?

You know that diamonds are expensive and water is cheap. Doesn’t that seem odd? Why do we place a higher value on useless diamonds than on essential-to-life water?

The theory of consumer choice that you’re going to study in this chapter answers questions like the ones we’ve just posed. Reading Between the Lines at the end of the chapter applies what you learn to a debate about whether sugary drinks should be banned or taxed to discourage their consumption.
Consumption Choices

The choices that you make as a buyer of goods and services—your consumption choices—are influenced by many factors. We can summarize them under two broad headings:

- Consumption possibilities
- Preferences

Consumption Possibilities

Your consumption possibilities are all the things that you can afford to buy. You can afford many different combinations of goods and services, but they are all limited by your income and by the prices that you must pay. For example, you might decide to spend a big part of your income on a gym membership and personal trainer and little on movies and music, or you might spend lots on movies and music and use the free gym at school.

The easiest way to describe consumption possibilities is to consider a model consumer who buys only two items. That’s what we’ll now do. We’ll study the consumption possibilities of Lisa, who buys only movies and soda.

A Consumer’s Budget Line

Consumption possibilities are limited by income and by the prices of movies and soda. When Lisa spends all her income, she reaches the limits to her consumption possibilities. We describe this limit with a budget line, which marks the boundary between those combinations of goods and services that a household can afford to buy and those that it cannot afford.

Figure 8.1 illustrates Lisa’s consumption possibilities of movies and soda and her budget line. Lisa has an income of $40 a month, the price of a movie is $8, and the price of soda is $4 a case. Rows A through F in the table show six possible ways of allocating $40 to these two goods. For example, in row A Lisa buys 10 cases of soda and sees no movies; in row F she sees 5 movies and buys 0 cases of soda; and in row C she sees 2 movies and buys 6 cases of soda.

Points A through F in the graph illustrate the possibilities presented in the table, and the line passing through these points is Lisa’s budget line.

The budget line constrains choices: It marks the boundary between what is affordable and unaffordable. Lisa can afford all the points on the budget line and inside it. Points outside the line are unaffordable.

Changes in Consumption Possibilities

Consumption possibilities change when income or prices change. A rise in income shifts the budget line outward but leaves its slope unchanged. A change in a price changes the slope of the line. Our goal is to predict the effects of such changes on consumption choices.

To do so, we must determine the choice a consumer makes. The budget line shows what is possible; preferences determine which possibility is chosen. We’ll now describe a consumer’s preferences.

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1 Chapter 9 explains an alternative model of consumer choice and pp. 203–204 provides some detail on how changes in income and prices change the budget line.
Marginal Utility

We define **marginal utility** as the change in total utility that results from a one-unit increase in the quantity of a good consumed.

In Table 8.1, the columns headed “Marginal utility” show Lisa’s marginal utility from movies and soda. You can see that if Lisa increases the soda she buys from 1 to 2 cases a month, her total utility from soda increases from 75 units to 123 units. For Lisa, the marginal utility from the second case each month is 48 units (123 – 75).

Marginal utility numbers appear midway between the quantities of soda because it is the change in the quantity she buys from 1 to 2 cases that produces the marginal utility of 48 units.

Marginal utility is positive, but it diminishes as the quantity of a good consumed increases.

Positive Marginal Utility

All the things that people enjoy and want more of have a positive marginal utility. Some objects and activities can generate negative marginal utility—and lower total utility. Two examples are hard labor and polluted air. But all the goods and services that people value and that we are thinking about here have positive marginal utility: Total utility increases as the quantity consumed increases.

Diminishing Marginal Utility

As Lisa sees more movies, her total utility from movies increases but her marginal utility from movies decreases. Similarly, as she

### Table 8.1
Lisa’s Utility from Movies and Soda

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CHAPTER 8 Utility and Demand

Graphing Lisa’s Utility Schedules

Figure 8.2(a) illustrates Lisa’s total utility from soda based on the numbers for the first 5 cases of soda in Table 8.1. Part (a) shows her total utility—increasing total utility. The bars along the total utility curve show the extra total utility from each additional case of soda—marginal utility. Part (b) shows Lisa’s diminishing marginal utility from soda.

Your Diminishing Marginal Utility

You’ve been studying all day and into the evening, and you’ve been too busy finishing an assignment to shop for soda. A friend drops by with a can of soda. The utility you get from that soda is the marginal utility from your first soda of the day—from one can. On another day you’ve been on a soda binge. You’ve been working on an assignment, but you’ve guzzled 10 cans of soda while doing so, and are now totally wired. You are happy enough to have one more can, but the thrill that you get from it is not very large. It is the marginal utility from the eleventh can in a day.

Graphing Lisa’s Utility Schedules

Figure 8.2(b) illustrates Lisa’s marginal utility from soda. It is a graph of the marginal utility numbers in Table 8.1. This graph shows Lisa’s diminishing marginal utility from soda. Her marginal utility curve slopes downward as she consumes more soda.

We’ve described Lisa’s consumption possibilities and preferences. Your next task is to see how Lisa chooses what to consume.

REVIEW QUIZ

1. Explain how a consumer’s income and the prices of goods limit consumption possibilities.
2. What is utility and how do we use the concept of utility to describe a consumer’s preferences?
3. What is the distinction between total utility and marginal utility?
4. What is the key assumption about marginal utility?

You can work these questions in Study Plan 8.1 and get instant feedback.
Utility-Maximizing Choice

Consumers want to get the most utility possible from their limited resources. They make the choice that maximizes utility. To discover this choice, we combine the constraint imposed by the budget and the consumer’s preferences and find the point on the budget line that gives the consumer the maximum attainable utility. Let’s find Lisa’s utility-maximizing choice.

A Spreadsheet Solution

Lisa’s most direct way of finding the quantities of movies and soda that maximize her utility is to make a table in a spreadsheet with the information and calculations shown in Table 8.2. Let’s see what that table tells us.

Find the Just-Affordable Combinations

Table 8.2 shows the combinations of movies and soda that Lisa can afford and that exhaust her $40 income. For example, in row A, Lisa buys only soda and at $4 a case she can buy 10 cases. In row B, Lisa sees 1 movie and buys 8 cases of soda. She spends $8 on the movie. At $4 a case, she spends $32 on soda and can buy 8 cases. The combination in row B just exhausts her $40. The combinations shown in the table are the same as those plotted on her budget line in Fig. 8.1.

We noted that the budget line shows that Lisa can also afford any combination inside the budget line. The quantities in those combinations would be smaller than the ones shown in Table 8.2 and they do not exhaust her $40. But smaller quantities don’t maximize her utility. Why? The marginal utilities of movies and soda are positive, so the more of each that Lisa buys, the more total utility she gets.

Find the Total Utility for Each Just-Affordable Combination

Table 8.2 shows the total utility that Lisa gets from the just-affordable quantities of movies and soda. The second and third columns show the numbers for movies and fourth and fifth columns show those for soda. The center column adds the total utility from movies to the total utility from soda. This number, the total utility from movies and soda, is what Lisa wants to maximize.

In row A of the table, Lisa sees no movies and buys 10 cases of soda. She gets no utility from movies and 260 units of utility from soda. Her total utility from movies and soda (the center column) is 260 units. In row C of the table, Lisa sees 2 movies and buys 6 cases of soda. She gets 90 units of utility from movies and 225 units of utility from soda. Her total utility from movies and soda is 315 units. This combination of movies and soda maximizes Lisa’s total utility. That is, given the prices of movies and soda, Lisa’s best choice when she has $40 to spend is to see 2 movies and buy 6 cases of soda.

If Lisa sees 1 movie, she can buy 8 cases of soda, but she gets only 298 units of total utility—17 units less than the maximum attainable. If she sees 3 movies, she can buy only 4 cases of soda. She gets 305 units of total utility—10 units less than the maximum attainable.

Consumer Equilibrium

We’ve just described Lisa’s consumer equilibrium. A consumer equilibrium is a situation in which a consumer has allocated all of his or her available income in the way that maximizes his or her total utility, given the prices of goods and services. Lisa’s consumer equilibrium is 2 movies and 6 cases of soda.

To find Lisa’s consumer equilibrium, we did something that an economist might do but that a consumer is not likely to do: We measured her total utility from all the affordable combinations of movies and soda and then, by inspection of the numbers, selected the combination that gives the highest total utility. There is a more natural way of finding a consumer’s equilibrium—a way that uses the idea that choices are made at the margin, as you first met in Chapter 1. Let’s look at this approach.
Choosing at the Margin

When you go shopping you don’t do utility calculations. But you do decide how to allocate your budget, and you do so in a way that you think is best for you. If you could make yourself better off by spending a few more dollars on an extra unit of one item and the same number of dollars less on something else, you would make that change. So, when you’ve allocated your budget in the best possible way, you can’t make yourself better off by spending more on one item and less on others.

Marginal Utility per Dollar  Economists interpret your best possible choice by using the idea of marginal utility per dollar. Marginal utility is the increase in total utility that results from consuming one more unit of a good. Marginal utility per dollar is the marginal utility from a good that results from spending one more dollar on it.

The distinction between these two marginal concepts is clearest for a good that is infinitely divisible, such as gasoline. You can buy gasoline by the smallest fraction of a gallon and literally choose to spend one more or one less dollar at the pump. The increase in total utility that results from spending one more dollar at the pump is the marginal utility per dollar from gasoline. When you buy a movie ticket or a case of soda, you must spend your dollars in bigger lumps. To buy our marginal movie ticket or case of soda, you must spend the price of one unit and your total utility increases by the marginal utility from that item.

So to calculate the marginal utility per dollar for movies (or soda), we must divide marginal utility from the good by its price.

Call the marginal utility from movies \(MU_M\) and the price of a movie \(P_M\). Then the marginal utility per dollar from movies is

\[
\frac{MU_M}{P_M}.
\]

Call the marginal utility from soda \(MU_S\) and the price of a case of soda \(P_S\). Then the marginal utility per dollar from soda is

\[
\frac{MU_S}{P_S}.
\]

By comparing the marginal utility per dollar from all the goods that a person buys, we can determine whether the budget has been allocated in the way that maximizes total utility.

Let’s see how we use the marginal utility per dollar to define a utility-maximizing rule.

Utility-Maximizing Rule  A consumer’s total utility is maximized by following the rule:

- Spend all the available income
- Equalize the marginal utility per dollar for all goods

Spend All the Available Income  Because more consumption brings more utility, only those choices that exhaust income can maximize utility. For Lisa, combinations of movies and soda that leave her with money to spend don’t give her as much total utility as those that exhaust her $40 per month income.

Equalize the Marginal Utility per Dollar  The basic idea behind this rule is to move dollars from good A to good B if doing so increases the utility from good A by more than it decreases the utility from good B. Such a utility-increasing move is possible if the marginal utility per dollar from good A exceeds that from good B.

But buying more of good A decreases its marginal utility. And buying less of good B increases its marginal utility. So by moving dollars from good A to good B, total utility rises, but the gap between the marginal utilities per dollar gets smaller.

As long as the gap exists—as long as the marginal utility per dollar from good A exceeds that from good B—total utility can be increased by spending more on A and less on B. But when enough dollars have been moved from B to A to make the two marginal utilities per dollar equal, total utility cannot be increased further. Total utility is maximized.

Lisa’s Marginal Calculation  Let’s apply the basic idea to Lisa. To calculate Lisa’s marginal utility per dollar, we divide her marginal utility numbers for each quantity of each good by the price of the good. The table in Fig. 8.3 shows these calculations for Lisa, and the graph illustrates the situation on Lisa’s budget line. The rows of the table are three of her affordable combinations of movies and soda.

Too Much Soda and Too Few Movies In row 2, Lisa sees 1 movie a month and consumes 8 cases of soda a month. Her marginal utility from seeing 1 movie a month is 50 units. Because the price of a movie is $8, Lisa’s marginal utility per dollar from movies is 50 units divided by $8, or 6.25 units of utility per dollar.

Lisa’s marginal utility from soda when she consumes 8 cases of soda a month is 10 units. Because the price of soda is $4 a case, Lisa’s marginal utility
per dollar from soda is 10 units divided by $4, or 2.50 units of utility per dollar.

When Lisa sees 1 movie and consumes 8 cases of soda a month, her marginal utility per dollar from soda is less than her marginal utility per dollar from movies. That is,

\[ MU_S/P_S < MU_M/P_M. \]

If Lisa spent an extra dollar on movies and a dollar less on soda, her total utility would increase. She would get 6.25 units from the extra dollar spent on movies and lose 2.50 units from the dollar less spent on soda. Her total utility would increase by 3.75 units (6.25 \(-\) 2.50).

**Too Little Soda and Too Many Movies** In row D, Lisa sees 3 movies a month and consumes 4 cases of soda. Her marginal utility from seeing the third movie a month is 32 units. At a price of $8 a movie, Lisa’s marginal utility per dollar from movies is 32 units divided by $8, or 4 units of utility per dollar.

Lisa’s marginal utility from soda when she buys 4 cases a month is 24 units. At a price of $4 a case, Lisa’s marginal utility per dollar from soda is 24 units divided by $4, or 6 units of utility per dollar.

When Lisa sees 3 movies and consumes 4 cases of soda a month, her marginal utility from soda exceeds her marginal utility from movies. That is,

\[ MU_S/P_S > MU_M/P_M. \]

If Lisa spent an extra dollar on soda and a dollar less on movies, her total utility would increase. She would get 6 units from the extra dollar spent on soda and would lose 4 units from the dollar less spent on movies. Her total utility would increase by 2 units (6 \(-\) 4).

**Utility-Maximizing Movies and Soda** In Fig. 8.3, if Lisa moves from row B to row C, she increases the movies she sees from 1 to 2 a month and decreases the soda she consumes from 8 to 6 cases a month. Her marginal utility per dollar from movies falls to 5 and her marginal utility per dollar from soda rises to 5.

Similarly, if Lisa moves from row D to row C, she decreases the movies she sees from 3 to 2 a month and increases the soda she consumes from 4 to 6 cases a month. Her marginal utility per dollar from movies rises to 5 and her marginal utility per dollar from soda falls to 5.

When Lisa sees 2 movies and consumes 6 cases of soda a month, her marginal utility per dollar from soda equals her marginal utility per dollar from movies. That is,

\[ MU_S/P_S = MU_M/P_M. \]

Lisa can’t move from this allocation of her budget without making herself worse off.
**The Power of Marginal Analysis**

The method we’ve just used to find Lisa’s utility-maximizing choice of movies and soda is an example of the power of marginal analysis. Lisa doesn’t need a computer and a spreadsheet program to maximize utility. She can achieve this goal by comparing the marginal gain from having more of one good with the marginal loss from having less of another good.

The rule that she follows is simple: If the marginal utility per dollar from movies exceeds the marginal utility per dollar from soda, see more movies and buy less soda; if the marginal utility per dollar from soda exceeds the marginal utility per dollar from movies, buy more soda and see fewer movies.

More generally, if the marginal gain from an action exceeds the marginal loss, take the action. You will meet this principle time and again in your study of economics, and you will find yourself using it when you make your own economic choices, especially when you must make big decisions.

**Revealing Preferences**

When we introduced the idea of utility, we arbitrarily chose 50 units as Lisa’s total utility from 1 movie, and we pretended that we asked Lisa to tell us how many units of utility she got from different quantities of soda and movies.

You’re now about to discover that we don’t need to ask Lisa to tell us her preferences. We can figure them out for ourselves by observing what she buys at various prices.

Also, the units in which we measure Lisa’s preferences don’t matter. Any arbitrary units will work. In this respect, utility is like temperature. Predictions about the freezing point of water don’t depend on the temperature scale; and predictions about a household’s consumption choice don’t depend on the units of utility.

**Lisa’s Preferences** In maximizing total utility by making the marginal utility per dollar equal for all goods, the units in which utility is measured do not matter.

You’ve seen that when Lisa maximizes her total utility, her marginal utility per dollar from soda, $MU_S/P_S$, equals her marginal utility per dollar from movies, $MU_M/P_M$. That is,

$$MU_S/P_S = MU_M/P_M.$$

Multiply both sides of this equation by the price of soda, $P_S$, to obtain

$$MU_S = MU_M \times (P_S/P_M).$$

This equation says that the marginal utility from soda, $MU_S$, is equal to the marginal utility from movies, $MU_M$, multiplied by the ratio of the price of soda, $P_S$, to the price of a movie, $P_M$.

The ratio $P_S/P_M$ is the relative price of soda in terms of movies: It is the number of movies that must be forgone to get 1 case of soda. It is also the opportunity cost of soda. (See Chapter 2, p. 33 and Chapter 3, p. 56.)

For Lisa, when $P_M = 8$ and $P_S = 4$ we observe that in a month she goes to the movies twice and buys 6 cases of soda. So we know that her $MU_S$ from 6 cases of soda equals her $MU_M$ from 2 movies multiplied by $4/8$ or 0.5. That is, for Lisa, the marginal utility from 6 cases of soda equals one-half of the marginal utility from 2 movies.

If we observe the choices that Lisa makes at more prices, we can find more rows in her utility schedule. By her choices, Lisa reveals her preferences.

**Units of Utility Don’t Matter** Lisa’s marginal utility from 2 movies is a half of her marginal utility from 6 cases of soda. So if the marginal utility from the second movie is 40 units, then the marginal utility from the sixth case of soda is 20 units. But if we call the marginal utility from the second movie 50 units, then the marginal utility from the sixth case of soda is 25 units. The units of utility are arbitrary.

**REVIEW QUIZ**

1. Why does a consumer spend the entire budget?
2. What is the marginal utility per dollar and how is it calculated?
3. What two conditions are met when a consumer is maximizing utility?
4. Explain why equalizing the marginal utility per dollar for all goods maximizes utility.

You can work these questions in Study Plan 8.2 and get instant feedback. MyEconLab

You now understand the marginal utility theory of consumer choices. Your next task is to see what the theory predicts.
Predictions of Marginal Utility Theory

We’re now going to use marginal utility theory to make some predictions. You will see that marginal utility theory predicts the law of demand. The theory also predicts that a fall in the price of a substitute of a good decreases the demand for the good and that for a normal good, a rise in income increases demand. All these effects, which in Chapter 3 we simply assumed, are predictions of marginal utility theory.

To derive these predictions, we will study the effects of three events:

- A fall in the price of a movie
- A rise in the price of soda
- A rise in income

A Fall in the Price of a Movie

With the price of a movie at $8 and the price of soda at $4, Lisa is maximizing utility by seeing 2 movies and buying 6 cases of soda each month. Then, with no change in her $40 income and no change in the price of soda, the price of a movie falls from $8 to $4. How does Lisa change her buying plans?

Finding the New Quantities of Movies and Soda

You can find the effect of a fall in the price of a movie on the quantities of movies and soda that Lisa buys in a three-step calculation.

1. Determine the just-affordable combinations of movies and soda at the new prices.
2. Calculate the new marginal utilities per dollar from the good whose price has changed.
3. Determine the quantities of movies and soda that make their marginal utilities per dollar equal.

Affordable Combinations

The lower price of a movie means that Lisa can afford more movies or more soda. Table 8.3 shows her new affordable combinations. In row \( A \), if she continues to see 2 movies a month, she can now afford 8 cases of soda and in row \( B \), if she continues to buy 6 cases of soda, she can now afford 4 movies. Lisa can afford any of the combinations shown in the rows of Table 8.3.

The next step is to find her new marginal utilities per dollar from movies.

New Marginal Utilities per Dollar from Movies

A person’s preferences don’t change just because a price has changed. With no change in her preferences, Lisa’s marginal utilities in Table 8.3 are the same as those in Table 8.1. But because the price of a movie has changed, the marginal utility per dollar from movies changes. In fact, with a halving of the price of a movie from $8 to $4, the marginal utility per dollar from movies has doubled.

The numbers in Table 8.3 show Lisa’s new marginal utility per dollar from movies for each quantity of movies. The table also shows Lisa’s marginal utility per dollar from soda for each quantity.

Equalizing the Marginal Utilities per Dollar

You can see that if Lisa continues to see 2 movies a month and buy 6 cases of soda, her marginal utility per dollar from movies (row \( A \)) is 10 units and her marginal utility per dollar from soda (row \( B \)) is 5 units. Lisa is buying too much soda and too few movies. If she spends a dollar more on movies and a dollar less on soda, her total utility increases by 5 units (10 – 5).

If Lisa continues to buy 6 cases of soda and increases the number of movies to 4 (row \( B \)), her...
marginal utility per dollar from movies falls to 7 units, but her marginal utility per dollar from soda is 5 units. Lisa is still buying too much soda and seeing too few movies. If she spends a dollar more on movies and a dollar less on soda, her total utility increases by 2 units \((7 - 5)\).

But if Lisa sees 6 movies and buys 4 cases of soda a month (row C), her marginal utility per dollar from movies (6 units) equals her marginal utility per dollar from soda and she is maximizing utility. If Lisa moves from this allocation of her budget in either direction, her total utility decreases.

Lisa’s increased purchases of movies results from a substitution effect—she substitutes the now lower-priced movies for soda—and an income effect—she can afford more movies.

**A Change in the Quantity Demanded** Lisa’s increase in the quantity of movies that she sees is a change in the quantity demanded. It is the change in the quantity of movies that she plans to see each month when the price of a movie changes and all other influences on buying plans remain the same. We illustrate a change in the quantity demanded by a movement along a demand curve.

Figure 8.4(a) shows Lisa’s demand curve for movies. When the price of a movie is $8, Lisa sees 2 movies a month. When the price of a movie falls to $4, she sees 6 movies a month. Lisa moves downward along her demand curve for movies.

The demand curve traces the quantities that maximize utility at each price, with all other influences remaining the same. You can also see that utility-maximizing choices generate a downward-sloping demand curve. Utility maximization with diminishing marginal utility implies the law of demand.

**A Change in Demand** The decrease in the quantity of soda that Lisa buys is the change in the quantity of soda that she plans to buy at a given price of soda when the price of a movie changes. It is a change in her demand for soda. We illustrate a change in demand by a shift of a demand curve.

Figure 8.4(b) shows Lisa’s demand curve for soda. The price of soda is fixed at $4 a case. When the price of a movie is $8, Lisa buys 6 cases of soda on demand curve \(D_0\). When the price of a movie falls to $4, Lisa buys 4 cases of soda on demand curve \(D_1\). The fall in the price of a movie decreases Lisa’s demand for soda. Her demand curve for soda shifts leftward. For Lisa, soda and movies are substitutes.

**FIGURE 8.4 A Fall in the Price of a Movie**

(a) Demand for movies

The decrease in the price of a movie falls and the price of soda remains the same, the quantity of movies demanded by Lisa increases, and in part (a), Lisa moves along her demand curve for movies. Also, when the price of a movie falls, Lisa’s demand for soda decreases, and in part (b), her demand curve for soda shifts leftward. For Lisa, soda and movies are substitutes.
A Rise in the Price of Soda

Now suppose that with the price of a movie at $4, the price of soda rises from $4 to $8 a case. How does this price change influence Lisa’s buying plans? We find the answer by repeating the three-step calculation with the new price of soda.

Table 8.4 shows Lisa’s new affordable combinations. In row A, if she continues to buy 4 cases of soda a month she can afford to see only 2 movies; and in row B, if she continues to see 6 movies a month, she can afford only 2 cases of soda.

Table 8.4 show Lisa’s marginal utility per dollar from soda for each quantity of soda when the price is $8 a case. The table also shows Lisa’s marginal utility per dollar from movies for each quantity.

If Lisa continues to buy 4 cases of soda (row A), her marginal utility per dollar from soda is 3. But she must cut the movies she sees to 2, which increases her marginal utility per dollar from movies to 10. Lisa is buying too much soda and too few movies. If she spends a dollar less on soda and a dollar more on movies, her utility increases by 7 units (10 – 3).

But if Lisa sees 6 movies a month and cuts her soda to 2 cases (row B), her marginal utility per dollar from movies (6 units) equals her marginal utility per dollar from soda. She is maximizing utility.

Lisa’s decreased purchases of soda results from an income effect—she can afford fewer cases and she buys fewer cases. But she continues to buy the same quantity of movies.

Lisa’s Demand for Soda  

Now that we’ve calculated the effect of a change in the price of soda on Lisa’s buying plans when income and the price of movies remain the same, we have found two points on her demand curve for soda: When the price of soda is $4 a case, Lisa buys 4 cases a month; and when the price of soda is $8 a case, she buys 2 cases a month.

Figure 8.5 shows these points on Lisa’s demand curve for soda. It also shows the change in the quantity of soda demanded when the price of soda rises and all other influences on Lisa’s buying plans remain the same.

In this example, Lisa continues to buy the same quantity of movies, but this outcome does not always occur. It is a consequence of Lisa’s preferences. With different marginal utilities, she might have decreased or increased the quantity of movies that she sees when the price of soda changes.

You’ve seen that marginal utility theory predicts the law of demand—the way in which the quantity demanded of a good changes when its price changes. Next, we’ll see how marginal utility theory predicts the effect of a change in income on demand.

**TABLE 8.4 How a Change in the Price of Soda Affects Lisa’s Choices**

<table>
<thead>
<tr>
<th>Movies ($4 each)</th>
<th>Soda ($8 per case)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Quantity</strong></td>
<td><strong>Marginal utility per dollar</strong></td>
</tr>
<tr>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>A</td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>B</td>
<td>6</td>
</tr>
<tr>
<td>8</td>
<td>2</td>
</tr>
<tr>
<td>10</td>
<td>16</td>
</tr>
</tbody>
</table>

**FIGURE 8.5 A Rise in the Price of Soda**

When the price of soda rises and the price of a movie and Lisa’s income remain the same, the quantity of soda demanded by Lisa decreases. Lisa moves along her demand curve for soda.

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MyEconLab animation
A Rise in Income

Suppose that Lisa’s income increases from $40 to $56 a month and that the price of a movie is $4 and the price of soda is $4 a case. With these prices and with an income of $40 a month, Lisa sees 6 movies and buys 4 cases of soda a month (Table 8.3). How does the increase in Lisa’s income from $40 to $56 change her buying plans?

Table 8.5 shows the calculations needed to answer this question. If Lisa continues to see 6 movies a month, she can now afford to buy 8 cases of soda (row A); if she continues to buy 4 cases of soda, she can now afford to see 10 movies (row C).

In row A, Lisa’s marginal utility per dollar from movies is greater than her marginal utility per dollar from soda. She is buying too much soda and too few movies. In row C, Lisa’s marginal utility per dollar from movies is less than her marginal utility per dollar from soda. She is buying too little soda and too many movies. But in row B, when Lisa sees 8 movies a month and buys 6 cases of soda, her marginal utility per dollar from movies equals that from soda. She is maximizing utility.

Figure 8.6 shows the effects of the rise in Lisa’s income on her demand curves for movies and soda. The price of each good is $4. When Lisa’s income rises to $56 a month, she sees 2 more movies and buys 2 more cases of soda. Her demand curves for both movies and soda shift rightward—her demand for both movies and soda increases. With a larger income, the consumer always buys more of a normal good. For Lisa, movies and soda are normal goods.

![FIGURE 8.6 The Effects of a Rise in Income](image)

TABLE 8.5 Lisa’s Choices with an Income of $56 a Month

<table>
<thead>
<tr>
<th>Movies ($4 each)</th>
<th>Soda ($4 per case)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Quantity</td>
</tr>
<tr>
<td></td>
<td>Quantity</td>
</tr>
<tr>
<td>4</td>
<td>28</td>
</tr>
<tr>
<td>5</td>
<td>26</td>
</tr>
<tr>
<td><strong>A</strong> 6</td>
<td>24</td>
</tr>
<tr>
<td>7</td>
<td>22</td>
</tr>
<tr>
<td><strong>B</strong> 8</td>
<td>20</td>
</tr>
<tr>
<td>9</td>
<td>17</td>
</tr>
<tr>
<td><strong>C</strong> 10</td>
<td>16</td>
</tr>
</tbody>
</table>

(a) Demand for movies

When Lisa’s income increases, her demand for movies and her demand for soda increase. Lisa’s demand curves for movies, in part (a), and for soda, in part (b), shift rightward. For Lisa, movies and soda are normal goods.
The Paradox of Value

The price of water is low and the price of a diamond is high, but water is essential to life while diamonds are used mostly for decoration. How can valuable water be so cheap while a relatively useless diamond is so expensive? This so-called paradox of value has puzzled philosophers for centuries. Not until the theory of marginal utility had been developed could anyone give a satisfactory answer.

The Paradox Resolved

The paradox is resolved by distinguishing between total utility and marginal utility. The total utility that we get from water is enormous. But remember, the more we consume of something, the smaller is its marginal utility.

We use so much water that its marginal utility—the benefit we get from one more glass of water or another 30 seconds in the shower—diminishes to a small value.

Diamonds, on the other hand, have a small total utility relative to water, but because we buy few diamonds, they have a high marginal utility.

When a household has maximized its total utility, it has allocated its income in the way that makes the marginal utility per dollar equal for all goods. That is, the marginal utility from a good divided by the price of the good is equal for all goods.

This equality of marginal utilities per dollar holds true for diamonds and water: Diamonds have a high price and a high marginal utility. Water has a low price and a low marginal utility. When the high marginal utility from diamonds is divided by the high price of a diamond, the result is a number that equals the low marginal utility from water divided by the low price of water. The marginal utility per dollar is the same for diamonds and water.

Value and Consumer Surplus

Another way to think about the paradox of value and illustrate how it is resolved uses consumer surplus. Figure 8.7 explains the paradox of value by using this idea. The supply of water in part (a) is perfectly elastic at price $P_W$, so the quantity of water consumed is $Q_W$ and the large green area shows the consumer surplus from water. The supply of diamonds in part (b) is perfectly inelastic at the quantity $Q_D$, so the price of a diamond is $P_D$ and the small green area shows the consumer surplus from diamonds. Water is cheap, but brings a large consumer surplus; diamonds are expensive, but bring a small consumer surplus.

Part (a) shows the demand for and supply of water. Supply is perfectly elastic at the price $P_W$. At this price, the quantity of water consumed is $Q_W$ and the large green triangle shows consumer surplus. Part (b) shows the demand for and supply of diamonds. Supply is perfectly inelastic at the quantity $Q_D$. At this quantity, the price of a diamond is $P_D$ and the small green triangle shows consumer surplus. Water is valuable—has a large consumer surplus—but cheap. Diamonds are less valuable than water—have a smaller consumer surplus—but are expensive.
CHAPTER 8 Utility and Demand

Temperature: An Analogy
Utility is similar to temperature—both are abstract concepts. You can’t observe temperature. You can observe water turning to steam if it is hot enough or turning to ice if it is cold enough. You can also construct an instrument—a thermometer—that can help you to predict when such changes will occur. We call the scale on the thermometer temperature and we call the units of temperature degrees. But like the units of utility, these degree units are arbitrary. We can use Celsius units or Fahrenheit units or some other units.

The concept of utility helps us to make predictions about consumption choices in much the same way that the concept of temperature helps us to make predictions about physical phenomena.

Admittedly, marginal utility theory does not enable us to predict how buying plans change with the same precision that a thermometer enables us to predict when water will turn to ice or steam. But the theory provides important insights into buying plans and has some powerful implications. It helps us to understand why people buy more of a good or service when its price falls and why people buy more of most goods when their incomes increase. It also resolves the paradox of value.

We’re going to end this chapter by looking at some new ways of studying individual economic choices and consumer behavior.

Economics in Action
Maximizing Utility from Recorded Music
In 2011, Americans spent $7 billion on recorded music, down from more than $14 billion in 1999. But the combined quantity of discs and downloads bought increased from 1.2 billion in 1999 to 1.8 billion in 2011 and the average price of a unit of recorded music fell from $12.60 to $3.89.

The average price fell because the mix of formats bought changed dramatically. In 1999, we bought 940 million CDs; in 2011, we bought only 241 million CDs and downloaded almost 1.5 billion music files. Figure 1 shows the longer history of the changing formats of recorded music.

The music that we buy isn’t just one good—it is several goods. Singles and albums are different goods; downloads and discs are different goods; and downloads to a computer and downloads to a cell phone are different goods. There are five major categories and the table shows the quantities of each that we bought in 2011 (excluding DVDs and cassettes).

<table>
<thead>
<tr>
<th>Format</th>
<th>Singles (millions in 2011)</th>
<th>Albums (millions in 2011)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disc</td>
<td>2</td>
<td>241</td>
</tr>
<tr>
<td>Download</td>
<td>1,306</td>
<td>105</td>
</tr>
<tr>
<td>Mobile</td>
<td>116</td>
<td>–</td>
</tr>
</tbody>
</table>

Source of data: Recording Industry Association of America.

Most people buy all their music in digital form, but many still buy physical CDs and some people buy both downloads and CDs.

We get utility from the singles and albums that we buy, and the more songs and albums we have, the more utility we get. But our marginal utility from songs and albums decreases as the quantity that we own increases.

We also get utility from convenience. A song that we can buy with a mouse click and play with the spin of a wheel is more convenient both to buy and to use than a song on a CD. The convenience of songs downloaded over the Internet means that, song for song, we get more utility from a song downloaded than we get from a song on a physical CD.

But most albums are still played at home on a CD player. So for most people, a physical CD is a more convenient medium for delivering an album. Album for album, people on average get more utility from a CD than from a download.

REVIEW QUIZ

1. When the price of a good falls and the prices of other goods and a consumer’s income remain the same, explain what happens to the consumption of the good whose price has fallen and to the consumption of other goods.

2. Elaborate on your answer to the previous question by using demand curves. For which good does demand change and for which good does the quantity demanded change?

3. If a consumer’s income increases and if all goods are normal goods, explain how the quantity bought of each good changes.

4. What is the paradox of value and how is the paradox resolved?

5. What are the similarities between utility and temperature?

You can work these questions in Study Plan 8.3 and get instant feedback.
When we decide how many singles and albums to download and how many to buy on CD, we compare the marginal utility per dollar from each type of music in each format. We make the marginal utility per dollar from each type of music in each format equal, as the equations below show.

The market for single downloads has created an enormous consumer surplus. In 2011, 1,306 million singles were downloaded at an average price of $1.14. In the same year, 2 million singles were bought on a disc (either a CD or vinyl) at an average price of $4.76 a disc. If we assume that $4.76 is the most that anyone would pay for a single download (probably an underestimate), the demand curve for single downloads is that shown in Fig. 2.

With the average price of a single download at $1.14, consumer surplus (the area of the green triangle in Fig. 2) is $2.4 billion.

\[
\frac{MU_{\text{single downloads}}}{P_{\text{single downloads}}} = \frac{MU_{\text{album downloads}}}{P_{\text{album downloads}}} = \frac{MU_{\text{physical singles}}}{P_{\text{physical singles}}} = \frac{MU_{\text{physical albums}}}{P_{\text{physical albums}}} = \frac{MU_{\text{mobile}}}{P_{\text{mobile}}} \\
\frac{1.14}{10.99} = \frac{4.76}{9.99} = \frac{2.39}{\phantom{\text{x}}} = \frac{\phantom{\text{x}}}{\phantom{\text{x}}}
\]

In the 1970s, recorded music came on vinyl discs. Cassettes gradually replaced vinyl, then compact discs (CDs) gradually replaced cassettes, and today, digital files downloaded to computers and mobile devices are replacing physical CDs.
CHAPTER 8 Utility and Demand

New Ways of Explaining Consumer Choices

When William Stanley Jevons developed marginal utility theory in the 1860s, he would have loved to look inside people’s brains and “see” their utility. But he believed that the human brain was the ultimate black box that could never be observed directly. For Jevons, and for most economists today, the purpose of marginal utility theory is to explain our actions, not what goes on inside our brains.

Economics has developed over the past 150 years with little help from and paying little attention to advances being made in psychology. Both economics and psychology seek to explain human behavior, but they have developed different ways of attacking the challenge.

A few researchers have paid attention to the potential payoff from exploring economic problems by using the tools of psychology. These researchers, some economists and some psychologists, think that marginal utility theory is based on a view of how people make choices that attributes too much to reason and rationality. They propose an alternative approach based on the methods of psychology.

Other researchers, some economists and some neuroscientists, are using new tools to look inside the human brain and open up Jevons’ “black box.”

This section provides a very brief introduction to these new and exciting areas of economics. We’ll explore the two related research agendas:

- Behavioral economics
- Neuroeconomics

Behavioral Economics

Behavioral economics studies the ways in which limits on the human brain’s ability to compute and implement rational decisions influences economic behavior—both the decisions that people make and the consequences of those decisions for the way markets work.

Behavioral economics starts with observed behavior. It looks for anomalies—choices that do not seem to be rational. It then tries to account for the anomalies by using ideas developed by psychologists that emphasize features of the human brain that limit rational choice.

In behavioral economics, instead of being rational utility maximizers, people are assumed to have three impediments that prevent rational choice: bounded rationality, bounded willpower, and bounded self-interest.

Bounded Rationality Bounded rationality is rationality that is limited by the computing power of the human brain. We can’t always work out the rational choice.

For Lisa, choosing between movies and soda, it seems unlikely that she would have much trouble figuring out what to buy. But toss Lisa some uncertainty and the task becomes harder. She’s read the reviews of “Ironman 2” on Fandango, but does she really want to see that movie? How much marginal utility will it give her? Faced with uncertainty, people might use rules of thumb, listen to the views of others, and make decisions based on gut instinct rather than on rational calculation.

Bounded Willpower Bounded willpower is the less-than-perfect willpower that prevents us from making a decision that we know, at the time of implementing the decision, we will later regret.

Lisa might be feeling particularly thirsty when she passes a soda vending machine. Under Lisa’s rational utility-maximizing plan, she buys her soda at the discount store, where she gets it for the lowest possible price. Lisa has already bought her soda for this month, but it is at home. Spending $1 on a can now means giving up a movie later this month.

Lisa’s rational choice is to ignore the temporary thirst and stick to her plan. But she might not possess the willpower to do so—sometimes she will and sometimes she won’t.

Bounded Self-Interest Bounded self-interest is the limited self-interest that results in sometimes suppressing our own interests to help others.

A hurricane hits the Florida coast and Lisa, feeling sorry for the victims, donates $10 to a fund-raiser. She now has only $30 to spend on movies and soda this month. The quantities that she buys are not, according to her utility schedule, the ones that maximize her utility.

The main applications of behavioral economics are in two areas: finance, where uncertainty is a key factor in decision making, and savings, where the future
New Ways of Explaining Consumer Choices

You have now completed your study of the marginal utility theory and some new ideas about how people make economic choices. It is called the endowment effect.

**The Endowment Effect** The endowment effect is the tendency for people to value something more highly simply because they own it. If you have allocated your income to maximize utility, then the price you would be willing to accept to give up something that you own (for example, your coffee mug) should be the same as the price you are willing to pay for an identical one.

In experiments, students seem to display the endowment effect: The price they are willing to pay for a coffee mug that is identical to the one they own is less than the price they would be willing to accept to give up the coffee mug that they own. Behavioral economists say that this behavior contradicts marginal utility theory.

**Neuroeconomics**

**Neuroeconomics** is the study of the activity of the human brain when a person makes an economic decision. The discipline uses the observational tools and ideas of neuroscience to obtain a better understanding of economic decisions.

Neuroeconomics is an experimental discipline. In an experiment, a person makes an economic decision and the electrical or chemical activity of the person's brain is observed and recorded using the same type of equipment that neurosurgeons use to diagnose brain disorders.

The observations provide information about which regions of the brain are active at different points in the process of making an economic decision.

Observations show that some economic decisions generate activity in the area of the brain (called the prefrontal cortex) where we store memories, analyze data, and anticipate the consequences of our actions. If people make rational utility-maximizing decisions, it is in this region of the brain that the decision occurs.

But observations also show that some economic decisions generate activity in the region of the brain (called the hippocampus) where we store memories of anxiety and fear. Decisions that are influenced by activity in this part of the brain might not be rational and be driven by fear or panic.

Neuroeconomists are also able to observe the amount of a brain hormone (called dopamine), the quantity of which increases in response to pleasurable events and decreases in response to disappointing events. These observations might one day enable neuroeconomists to actually measure utility and shine a bright light inside what was once believed to be the ultimate black box.

**Controversy**

The new ways of studying consumer choice that we've briefly described here are being used more widely to study business decisions and decisions in financial markets, and this type of research is surely going to become more popular.

But behavioral economics and neuroeconomics generate controversy. Most economists hold the view of Jevons that the goal of economics is to explain the decisions that we observe people making and not to explain what goes on inside people's heads.

Most economists would prefer to probe apparent anomalies more deeply and figure out why they are not anomalies after all.

Economists also point to the power of marginal utility theory and its ability to explain consumer choice and demand as well as resolve the paradox of value.

**REVIEW QUIZ**

1. Define behavioral economics.
2. What are the three limitations on human rationality that behavioral economics emphasizes?
3. Define neuroeconomics.
4. What do behavioral economics and neuroeconomics seek to achieve?

You can work these questions in Study Plan 8.4 and get instant feedback. MyEconLab

You have now completed your study of the marginal utility theory and some new ideas about how people make economic choices. You can see marginal utility theory in action once again in Reading Between the Lines on pp. 194–195, where it is used to compare the effects of a tax on or a ban on big cups of sugary soft drinks.
Influencing Consumer Choice for Sugary Drinks

Drinks Groups Sue Over NY “Supersize” Ban

Financial Times
October 13, 2012

The U.S. beverage industry is taking the administration of Michael Bloomberg, New York mayor, to court over its decision to ban sales of “supersized” sugary drinks.

Trade groups led by the American Beverage Association filed a lawsuit late on Friday in New York state court attempting to block the rule, which is set to be imposed next spring.

Last month, New York’s board of health voted to approve a proposal made by Mr. Bloomberg in May that would prohibit restaurants, theaters, and stadiums from selling sugary drinks in portions bigger than 16fl oz. …

The lawsuit comes as the soda industry is locked in an increasingly contentious battle with regulators over labeling and taxation of their products. Industry groups are currently fighting soda tax proposals in two California cities and have successfully pushed back several other similar efforts. …

Marc La Vorgna, a spokesman for Mr. Bloomberg, called the lawsuit baseless and suggested that the drinks industry would fail to stop the ban.

“For 100 years, major public health decisions—the posting of calorie counts, the ban of transfats, the sanitation of the sewage system, the fluoridation of the water system, and much more—have been left to a board of health professionals and it has benefited the health of New Yorkers,” he said. “The mayor’s plan to limit the size of sugary beverages—the leading contributor to the obesity epidemic—has spurred a long overdue national dialogue on obesity.”

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ECONOMIC ANALYSIS

- Concerned that people are choosing to consume more sugary soda than is healthy, New York mayor Michael Bloomberg wants to ban large serves and the City of Richmond, CA, is considering a 1-penny-per-ounce tax.
- Consumers choose to buy the quantity of sugary drinks that maximizes utility.
- To do so, they make the marginal utility per dollar for all other goods and services equal to the marginal utility per dollar for sugary drinks. That is:
  \[
  \frac{MU_O}{P_O} = \frac{MU_S}{P_S}.
  \]
- Because of the way in which drinks are sold, there isn’t a single price. The table shows some prices in St. Louis in June 2012.

<table>
<thead>
<tr>
<th>Prices of Sugary Drinks</th>
<th>Size (ounces)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>At the movies</td>
</tr>
<tr>
<td>20</td>
<td>4.00</td>
</tr>
<tr>
<td>32</td>
<td>4.50</td>
</tr>
<tr>
<td>44</td>
<td>5.00</td>
</tr>
<tr>
<td>52</td>
<td>5.50</td>
</tr>
<tr>
<td>104</td>
<td>(free refill)</td>
</tr>
</tbody>
</table>
- These prices tell us that people who buy their drinks in big cups pay a lower price per ounce.
- Because a person who buys a 52-ounce cup gets a free refill, the price of the marginal ounce for that person is zero. With a price of zero, the buyer drinks the quantity at which marginal utility is also zero.
- The suggestions for decreasing the consumption of sugary drinks are ways of raising the price.
- A tax raises the price because the tax is added to the price received by the seller. A ban on large cups raises the price because the price per ounce is higher for small cups than for large cups. Both have a similar outcome.
- Faced with a higher price of sugary drinks, a consumer maximizes utility by consuming a smaller quantity of sugary drinks.
- The reason is that consumer equilibrium becomes
  \[
  \frac{MU_O}{P_O} = \frac{MU_S}{P_S + \text{tax}}.
  \]
- When a tax is imposed, the price doesn’t rise by the entire amount of the tax, but generally \( P_S + \text{tax} \) is greater than the price before that tax was imposed.
- Because \( P_S + \text{tax} \) is greater than \( P_S \), \( MU_S \) must rise to restore the equality of the marginal utilities per dollar. But to increase \( MU_S \), the quantity of sugary drinks consumed must decrease.
- Figure 1 illustrates and makes clear why consumption of sugary drinks decreases.
- Suppose that with no tax, the budget line is \( BL_0 \) and to make the marginal utilities per dollar equal, the consumer buys 60 ounces of drinks and 100 units of other goods and services per day.
- A tax raises the price to \( P_S + \text{tax} \) and the budget line becomes steeper as \( BL_1 \).
- If the consumer continues to drink 60 ounces per day, the quantity of other items bought must fall to 50 units a day. \( MU_O \) rises and
  \[
  \frac{MU_O}{P_O} > \frac{MU_S}{P_S + \text{tax}}.
  \]
- To restore maximum utility, the consumer buys a smaller quantity of sugary drinks, which increases \( MU_S \), and a greater quantity of other goods, which decreases \( MU_O \).
- A movement up along the budget line \( BL_1 \) shows these changes in quantities consumed.
- The consumer substitutes other goods and services for sugary drinks until
  \[
  \frac{MU_O}{P_O} = \frac{MU_S}{P_S + \text{tax}}.
  \]
- At this point, the consumer is again maximizing utility.

![Figure 1 The Effect of a Tax](image-url)
CHAPTER 8 Utility and Demand

SUMMARY

Key Points

Consumption Choices (pp. 178–180)
- A household’s consumption choices are determined by its consumption possibilities and preferences.
- A budget line defines a household’s consumption possibilities.
- A household’s preferences can be described by a utility schedule that lists the total utility and marginal utility derived from various quantities of goods and services consumed.
- The principle of diminishing marginal utility is that the marginal utility from a good or service decreases as consumption of the good or service increases.

Working Problems 1 to 5 will give you a better understanding of consumption choices.

Utility-Maximizing Choice (pp. 181–184)
- A consumer’s objective is to maximize total utility.
- Total utility is maximized when all the available income is spent and when the marginal utility per dollar from all goods is equal.
- If the marginal utility per dollar for good A exceeds that for good B, total utility increases if the quantity purchased of good A increases and the quantity purchased of good B decreases.

Working Problems 6 to 11 will give you a better understanding of a consumer’s utility-maximizing choice.

Predictions of Marginal Utility Theory (pp. 185–191)
- Marginal utility theory predicts the law of demand. That is, other things remaining the same, the higher the price of a good, the smaller is the quantity demanded of that good.
- Marginal utility theory also predicts that, other things remaining the same, an increase in the consumer’s income increases the demand for a normal good.
- Marginal utility theory resolves the paradox of value.
- Total value is total utility or consumer surplus. But price is related to marginal utility.
- Water, which we consume in large amounts, has a high total utility and a large consumer surplus, but the price of water is low and the marginal utility from water is low.
- Diamonds, which we buy in small quantities, have a low total utility and a small consumer surplus, but the price of a diamond is high and the marginal utility from diamonds is high.

Working Problems 12 to 21 will give you a better understanding of the predictions of marginal utility theory.

New Ways of Explaining Consumer Choices (pp. 192–193)
- Behavioral economics studies limits on the ability of the human brain to compute and implement rational decisions.
- Bounded rationality, bounded willpower, and bounded self-interest are believed to explain some choices.
- Neuroeconomics uses the ideas and tools of neuroscience to study the effects of economic events and choices inside the human brain.

Working Problems 22 and 23 will give you a better understanding of the new ways of explaining consumer choices.

Key Terms

Behavioral economics, 192
Budget line, 178
Consumer equilibrium, 181
Diminishing marginal utility, 180
Marginal utility, 179
Marginal utility per dollar, 182
Neuroeconomics, 193
Preferences, 179
Total utility, 179
Utility, 179
Consumption Choices (Study Plan 8.1)

Jerry has $12 a week to spend on yogurt and magazines. The price of yogurt is $2, and the price of a magazine is $4.

1. List the combinations of yogurt and magazines that Jerry can afford. Draw a graph of Jerry’s budget line with the quantity of magazines plotted on the x-axis.

2. Describe how Jerry’s consumption possibilities change if, other things remaining the same, (i) the price of a magazine falls and (ii) Jerry’s income increases.

Use the following data to work Problems 3 to 9.

Max enjoys windsurfing and snorkeling. Max has $35 a day to spend, and he can spend as much time as he likes on his leisure pursuits. The price of renting equipment for windsurfing is $10 an hour and for snorkeling is $5 an hour. The table shows the total utility Max gets from each activity.

<table>
<thead>
<tr>
<th>Hours per day</th>
<th>Total utility from windsurfing</th>
<th>Total utility from snorkeling</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>120</td>
<td>40</td>
</tr>
<tr>
<td>2</td>
<td>220</td>
<td>76</td>
</tr>
<tr>
<td>3</td>
<td>300</td>
<td>106</td>
</tr>
<tr>
<td>4</td>
<td>360</td>
<td>128</td>
</tr>
<tr>
<td>5</td>
<td>396</td>
<td>140</td>
</tr>
<tr>
<td>6</td>
<td>412</td>
<td>150</td>
</tr>
<tr>
<td>7</td>
<td>422</td>
<td>158</td>
</tr>
</tbody>
</table>

3. Calculate Max’s marginal utility from windsurfing at each number of hours per day. Does Max’s marginal utility from windsurfing obey the principle of diminishing marginal utility?

4. Calculate Max’s marginal utility from snorkeling at each number of hours per day. Does Max’s marginal utility from snorkeling obey the principle of diminishing marginal utility?

5. Which does Max enjoy more: his 6th hour of windsurfing or his 6th hour of snorkeling?

Utility-Maximizing Choice (Study Plan 8.2)

6. Make a table that shows the various combinations of hours spent windsurfing and snorkeling that Max can afford.

7. In your table in Problem 6, add two columns and list Max’s marginal utility per dollar from windsurfing and from snorkeling.

8. a. How many hours does Max windsurf and how many hours does he snorkel to maximize his utility?
   b. If Max spent a dollar more on windsurfing and a dollar less on snorkeling than in part (a), by how much would his total utility change?
   c. If Max spent a dollar less on windsurfing and a dollar more on snorkeling than in part (a), by how much would his total utility change?

9. Explain why, if Max equalized the marginal utility per hour from windsurfing and from snorkeling, he would not maximize his utility.

10. Schools Get a Lesson in Lunch Line Economics

Sharp rises in the cost of milk, grain, and fresh fruits and vegetables are hitting cafeterias across the country, forcing cash-strapped schools to raise prices or serve more economical dishes. For example, Fairfax schools serve oranges—14¢ each—instead of grapes, which are 25¢ a serving.

Source: The Washington Post, April 14, 2008

Assume that a Fairfax school has a $14 daily fruit budget.

a. How many oranges a day can the school afford to serve if it serves no grapes? How many servings of grapes can the school afford each day if it serves no oranges?

b. If the school provides 50 oranges a day and maximizes utility, how many servings of grapes does it provide? If the marginal utility from an orange is 14 units, what is the marginal utility from a serving of grapes?

11. Can Money Buy Happiness?

Whoever said money can’t buy happiness isn’t spending it right. There must be some connection, but once your basic human needs are met, does more money buy more happiness? An increase in income from $20,000 a year to $50,000 makes you twice as likely to be happy, but the payoff from more than $90,000 is slight.

Source: CNN, July 18, 2006
a. What does the fundamental assumption of marginal utility theory suggest about the connection between money and happiness?  
b. Explain why this news clip is consistent with marginal utility theory.

Predictions of Marginal Utility Theory  
(Study Plan 8.3)  
Use the data in Problem 3 to work Problems 12 to 16.

12. Max is offered a special deal: The price of renting windsurfing equipment is cut to $5 an hour.  
   How many hours does Max spend windsurfing and how many hours does he spend snorkeling?  
13. Draw Max’s demand curve for rented windsurfing equipment. Over the price range from $5 to $10 an hour, is Max’s demand for windsurfing equipment elastic or inelastic?  
14. How does Max’s demand for snorkeling equipment change when the price of windsurfing equipment falls? What is Max’s cross elasticity of demand for snorkeling with respect to the price of windsurfing? Are windsurfing and snorkeling substitutes or complements for Max?  
15. If Max’s income increases from $35 to $55 a day, how does his demand for rented windsurfing equipment change? Is windsurfing a normal good or an inferior good for Max? Explain.  
16. If Max’s income increases from $35 to $55 a day, how does his demand for rented snorkeling equipment change? Is snorkeling a normal good or an inferior good for Max? Explain.

Use the following news clip to work Problems 17 and 18.

Compared to Other Liquids, Gasoline is Cheap  
In 2008, when gasoline hit $4 a gallon, motorists complained, but they didn’t complain about $1.59 for a 20-oz Gatorade and $18 for 16 mL of HP ink.  
The prices per gallon are $10.17 for Gatorade and $4,294.58 for printer ink.  

17. a. What does marginal utility theory predict about the marginal utility per dollar from gasoline, Gatorade, and printer ink?  
b. What do the prices per gallon tell you about the marginal utility from a gallon of gasoline, Gatorade, and printer ink?  
18. a. What do the prices per unit reported in the news clip tell you about the marginal utility from a gallon of gasoline, a 20-oz bottle of Gatorade, and a cartridge of printer ink?  
b. How can the paradox of value be used to explain why the fluids listed in the news clip might be less valuable than gasoline, yet far more expensive?

Use the following news clip to work Problems 19 to 21.

Exclusive Status: It’s in the Bag; $52,500 Purses.  
24 Worldwide. 1 in Washington.  
Forget your Coach purse. Put away your Kate Spade. Even Hermes’s famous Birkin bag seems positively discount. The Louis Vuitton Tribute Patchwork is this summer’s ultimate status bag, ringing in at $52,500, and the company is offering only five for sale in North America and 24 worldwide.  
19. Use marginal utility theory to explain the facts reported in the news clip.  
20. If Louis Vuitton offered 500 Tribute Patchwork bags in North America and 2,400 worldwide, what do you predict would happen to the price that buyers would be willing to pay and what would happen to the consumer surplus?  
21. If the Tribute Patchwork bag is copied and thousands are sold illegally, what do you predict would happen to the price that buyers would be willing to pay for a genuine bag and what would happen to the consumer surplus?

New Ways of Explaining Consumer Choices  
(Study Plan 8.4)  
Use the following news clip to work Problems 22 and 23.

Eating Away the Innings in Baseball’s Cheap Seats  
Baseball and gluttony, two of America’s favorite pastimes, are merging and taking hold at Major League Baseball stadiums: all-you-can-eat seats. Some fans try to “set personal records” during their first game in the section, but by their second or third time in such seats they eat normally, just as they would at a game.  
Source: USA Today, March 6, 2008  
22. a. What conflict might exist between utility-maximization and setting “personal records” for eating?  
b. What does the fact that fans eat less at subsequent games indicate about the marginal utility from ballpark food as the quantity consumed increases?  
23. a. How can setting personal records for eating be reconciled with marginal utility theory?  
b. Which ideas of behavioral economics are consistent with the information in the news clip?
Additional Problems and Applications

Consumption Choices

24. Tim buys 2 pizzas and sees 1 movie a week when he has $16 to spend, a movie ticket is $8, and a pizza is $4. Draw Tim’s budget line. If the price of a movie ticket falls to $4, describe how Tim’s consumption possibilities change.

25. Cindy has $70 a month to spend, and she can spend as much time as she likes playing golf and tennis. The price of an hour of golf is $10, and the price of an hour of tennis is $5. The table shows Cindy’s marginal utility from each sport.

<table>
<thead>
<tr>
<th>Hours per month</th>
<th>Marginal utility from golf</th>
<th>Marginal utility from tennis</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>80</td>
<td>40</td>
</tr>
<tr>
<td>2</td>
<td>60</td>
<td>36</td>
</tr>
<tr>
<td>3</td>
<td>40</td>
<td>30</td>
</tr>
<tr>
<td>4</td>
<td>30</td>
<td>10</td>
</tr>
<tr>
<td>5</td>
<td>20</td>
<td>5</td>
</tr>
<tr>
<td>6</td>
<td>10</td>
<td>2</td>
</tr>
<tr>
<td>7</td>
<td>6</td>
<td>1</td>
</tr>
</tbody>
</table>

Make a table that shows Cindy’s affordable combinations of hours playing golf and tennis. If Cindy increases her expenditure to $100, describe how her consumption possibilities change.

Utility-Maximizing Choice

Use the information in Problem 25 to work Problems 26 and 27.

26. a. When Cindy has $70 to spend on golf and tennis, how many hours of golf and how many hours of tennis does she play to maximize her utility?
   b. Compared to part (a), if Cindy spent a dollar more on golf and a dollar less on tennis, by how much would her total utility change?
   c. Compared to part (a), if Cindy spent a dollar less on golf and a dollar more on tennis, by how much would her total utility change?

27. Explain why, if Cindy equalized the marginal utility per hour of golf and tennis, she would not maximize her utility.

Predictions of Marginal Utility Theory

28. Use the information in Problem 25. Cindy’s tennis club raises its price of an hour of tennis to $10. The price of golf remains at $10 an hour and Cindy continues to spend $70 on tennis and golf.
   a. List the combinations of hours spent playing golf and tennis that Cindy can now afford.
   b. Along with the combinations in part (a), list Cindy’s marginal utility per dollar from golf and from tennis.
   c. How many hours does Cindy now spend playing golf and how many hours does she spend playing tennis?

Use the information in Problems 25, 26, and 28 to work Problems 29 to 32.

29. Use your answers to Problems 26a and 28 to draw Cindy’s demand curve for tennis. Over the price range of $5 to $10 an hour of tennis, is Cindy’s demand for tennis elastic or inelastic?

30. Use your answers to Problems 26a and 28 to explain how Cindy’s demand for golf changed when the price of an hour of tennis increased. What is Cindy’s cross elasticity of demand for golf with respect to the price of tennis? Are tennis and golf substitutes or complements for Cindy?

31. Cindy loses her math tutoring job and the amount she has to spend on golf and tennis falls to $35 a month. How does Cindy’s demand for golf change? For Cindy, is golf a normal good or an inferior good? Is tennis a normal good or an inferior good?

32. Cindy takes a Club Med vacation, the cost of which includes unlimited sports activities. With no extra charge for golf and tennis, Cindy allocates a total of 4 hours a day to these activities.
   a. How many hours does Cindy play golf and how many hours does she play tennis?
   b. What is Cindy’s marginal utility from golf and from tennis?
   c. Why does Cindy equalize the marginal utilities rather than the marginal utility per dollar from golf and from tennis?
33. **Blu-Ray Format Expected to Dominate, but When?**

Blu-ray stomped HD DVD to become the standard format for high-definition movie discs, but when will it claim victory over the old DVD? Buyers of $2,000, 40-inch TVs are the ones that will lead the charge. Everyone else will follow when the price falls. Blu-ray machine prices are now starting to drop and Wal-Mart Stores Inc. began stocking a $298 Magnavox model. That’s cheaper than most alternatives, but a hefty price hike from a typical $50 DVD player.

*Source: CNN, June 2, 2008*

**a.** What does marginal utility theory predict about the marginal utility from a Magnavox Blu-ray machine compared to the marginal utility from a typical DVD player?

**b.** What will have to happen to the marginal utility from a Blu-ray machine before it is able to “claim victory over the old DVD”?

34. **Ben spends $50 a year on 2 bunches of flowers and $50 a year on 10,000 gallons of tap water. Ben is maximizing utility and his marginal utility from water is 0.5 unit per gallon.**

**a.** Are flowers or water more valuable to Ben?

**b.** Explain how Ben’s expenditure on flowers and water illustrates the paradox of value.

### Economics in the News

38. **After you have studied Reading Between the Lines (pp. 194–195), answer the following questions.**

**a.** If big cups of sugary drinks are banned at restaurants, theaters, and stadiums:

(i) How will the price of an ounce of sugary drink change?

(ii) How will consumers respond to the change in price?

**b.** If a tax is imposed on sugary drinks, how does

(i) The marginal utility of a sugary drink change?

(ii) The consumer surplus in the market for sugary drinks change?

39. **Five Signs You Have Too Much Money**

When a bottle of water costs $38, it’s hard not to agree that bottled water is a fool’s drink. The drink of choice among image-conscious status seekers and high-end tee-totalers in L.A. is Bling H2O. It’s not the water that accounts for the cost of the $38, but the “limited edition” bottle decked out in Swarovski crystals.

*Source: CNN, January 17, 2006*

**a.** Assuming that the price of a bottle of Bling H2O is $38 in all the major U.S. cities, what might its popularity in Los Angeles reveal about consumers’ incomes or preferences in Los Angeles relative to other U.S. cities?

**b.** Why might the marginal utility from a bottle of Bling H2O decrease more rapidly than the marginal utility from ordinary bottled water?

40. **How to Buy Happiness. Cheap**

On any day, the rich tend to be a bit happier than the poor, but increases in average living standards don’t seem to make people happier. The drink of choice among image-conscious status seekers and high-end tee-totalers in L.A. is Bling H2O. It’s not the water that accounts for the cost of the $38, but the “limited edition” bottle decked out in Swarovski crystals.

*Source: CNN, October 1, 2004*

**a.** Assuming that the price of a bottle of Bling H2O is $38 in all the major U.S. cities, what might its popularity in Los Angeles reveal about consumers’ incomes or preferences in Los Angeles relative to other U.S. cities?

**b.** Why might the marginal utility from a bottle of Bling H2O decrease more rapidly than the marginal utility from ordinary bottled water?
The iPad has revolutionized the way we read magazines, books, and even recipes in the kitchen. Yet the magazine racks and bookstore shelves are still stuffed with traditional printed paper. Similarly, low-priced on-demand movies and DVD rentals have made it easier to watch a movie at home. Yet we’re also going to movie theaters in ever-greater numbers.

In this chapter, we’re going to study a model that explains the choices we make and applies it to choices about using new and old technologies. At the end of the chapter in *Reading Between the Lines*, we use the model to explain why e-books are taking off and replacing printed books.

After studying this chapter, you will be able to:

- Describe a household’s budget line and show how it changes when prices or income change
- Use indifference curves to map preferences and explain the principle of diminishing marginal rate of substitution
- Predict the effects of changes in prices and income on consumption choices
Consumption Possibilities

Consumption choices are limited by income and by prices. A household has a given amount of income to spend and cannot influence the prices of the goods and services it buys. A household’s budget line describes the limits to its consumption choices.

Let’s look at Lisa’s budget line.* Lisa has an income of $40 a month to spend. She buys two goods: movies and soda. The price of a movie is $8, and the price of soda is $4 a case.

Figure 9.1 shows alternative combinations of movies and soda that Lisa can afford. In row A, she sees no movies and buys 10 cases of soda. In row F, she sees 5 movies and buys no soda. Both of these combinations of movies and soda exhaust the $40 available. Check that the combination of movies and soda in each of the other rows also exhausts Lisa’s $40 of income. The numbers in the table and the points A through F in the graph describe Lisa’s consumption possibilities.

Divisible and Indivisible Goods Some goods—called divisible goods—can be bought in any quantity desired. Examples are gasoline and electricity. We can best understand household choice if we suppose that all goods and services are divisible. For example, Lisa can see half a movie a month on average by seeing one movie every two months. When we think of goods as being divisible, the consumption possibilities are not only the points A through F shown in Fig. 9.1, but also all the intermediate points that form the line running from A to F. This line is Lisa’s budget line.

Affordable and Unaffordable Quantities Lisa’s budget line is a constraint on her choices. It marks the boundary between what she can and cannot afford. She can afford any point on the line and inside it. She cannot afford any point outside the line. The constraint on her consumption depends on the prices and her income, and the constraint changes when the price of a good or her income changes. To see how, we use a budget equation.

*If you have studied Chapter 8 on marginal utility theory, you have already met Lisa. This tale of her thirst for soda and zeal for movies will sound familiar to you—up to a point. In this chapter, we’re going to explore her budget line in more detail and use a different method for representing preferences—one that does not require the idea of utility.

Lisa’s budget line shows the boundary between what she can and cannot afford. The rows of the table list Lisa’s affordable combinations of movies and soda when her income is $40, the price of soda is $4 a case, and the price of a movie is $8. For example, row A tells us that Lisa spends all of her $40 income when she buys 10 cases of soda and sees no movies. The figure graphs Lisa’s budget line. Points A through F in the graph represent the rows of the table. For divisible goods, the budget line is the continuous line AF. To calculate the equation for Lisa’s budget line, start with expenditure equal to income:

\[ 4Q_S + 8Q_M = 40. \]

Divide by $4 to obtain

\[ Q_S + 2Q_M = 10. \]

Subtract $2Q_M from both sides to obtain

\[ Q_S = 10 - 2Q_M. \]
Budget Equation

We can describe the budget line by using a budget equation. The budget equation starts with the fact that

\[
\text{Expenditure} = \text{Income}.
\]

Expenditure is equal to the sum of the price of each good multiplied by the quantity bought. For Lisa,

\[
\text{Expenditure} = (\text{Price of soda} \times \text{Quantity of soda}) + (\text{Price of movie} \times \text{Quantity of movies}).
\]

Call the price of soda \(P_S\), the quantity of soda \(Q_S\), the price of a movie \(P_M\), the quantity of movies \(Q_M\), and income \(Y\). We can now write Lisa’s budget equation as

\[
P_S Q_S + P_M Q_M = Y.
\]

Or, using the prices Lisa faces, $4 a case of soda and $8 a movie, and Lisa’s income, $40, we get

\[
$4 Q_S + $8 Q_M = $40.
\]

Lisa can choose any quantities of soda \((Q_S)\) and movies \((Q_M)\) that satisfy this equation. To find the relationship between these quantities, divide both sides of the equation by the price of soda \(P_S\) to get

\[
Q_S + \frac{P_M}{P_S} \times Q_M = \frac{Y}{P_S}.
\]

Now subtract the term \((P_M/P_S) \times Q_M\) from both sides of this equation to get

\[
Q_S = \frac{Y}{P_S} - \frac{P_M}{P_S} \times Q_M.
\]

For Lisa, income \((Y)\) is $40, the price of a movie \((P_M)\) is $8, and the price of soda \((P_S)\) is $4 a case. So Lisa must choose the quantities of movies and soda to satisfy the equation

\[
Q_S = \frac{$40}{$4} - \frac{$8}{$4} \times Q_M,
\]

or

\[
Q_S = 10 - 2Q_M.
\]

To interpret the equation, look at the budget line in Fig. 9.1 and check that the equation delivers that budget line. First, set \(Q_M\) equal to zero. The budget equation tells us that \(Q_S\), the quantity of soda, is \(Y/P_S\), which is 10 cases. This combination of \(Q_M\) and \(Q_S\) is the one shown in row \(A\) of the table in Fig. 9.1. Next set \(Q_M\) equal to 5. \(Q_S\) now equals zero (row \(F\) of the table). Check that you can derive the other rows.

The budget equation contains two variables chosen by the household \((Q_M \text{ and } Q_S)\) and two variables that the household takes as given \((Y/P_S \text{ and } P_M/P_S)\). Let’s look more closely at these variables.

Real Income A household’s real income is its income expressed as a quantity of goods that the household can afford to buy. Expressed in terms of soda, Lisa’s real income is \(Y/P_S\). This quantity is the maximum quantity of soda that she can buy. It is equal to her money income divided by the price of soda. Lisa’s money income is $40 and the price of soda is $4 a case, so her real income in terms of soda is 10 cases, which is shown in Fig. 9.1 as the point at which the budget line intersects the \(y\)-axis.

Relative Price A relative price is the price of one good divided by the price of another good. In Lisa’s budget equation, the variable \(P_M/P_S\) is the relative price of a movie in terms of soda. For Lisa, \(P_M\) is $8 a movie and \(P_S\) is $4 a case, so \(P_M/P_S\) is equal to 2 cases of soda per movie. That is, to see 1 movie, Lisa must give up 2 cases of soda.

You’ve just calculated Lisa’s opportunity cost of seeing a movie. Recall that the opportunity cost of an action is the best alternative forgone. For Lisa to see 1 more movie a month, she must forgo 2 cases of soda. You’ve also calculated Lisa’s opportunity cost of soda. For Lisa to buy 2 more cases of soda a month, she must forgo seeing 1 movie. So her opportunity cost of 2 cases of soda is 1 movie.

The relative price of a movie in terms of soda is the magnitude of the slope of Lisa’s budget line. To calculate the slope of the budget line, recall the formula for slope (see the Chapter 1 Appendix): Slope equals the change in the variable measured on the \(y\)-axis divided by the change in the variable measured on the \(x\)-axis as we move along the line. In Lisa’s case (Fig. 9.1), the variable measured on the \(y\)-axis is the quantity of soda and the variable measured on the \(x\)-axis is the quantity of movies. Along Lisa’s budget line, as soda decreases from 10 to 0 cases, movies increase from 0 to 5. So the magnitude of the slope of the budget line is 10 cases divided by 5 movies, or 2 cases of soda per movie. The magnitude of this slope is exactly the same as the relative price we’ve just calculated. It is also the opportunity cost of a movie.

A Change in Prices When prices change, so does the budget line. The lower the price of the good measured on the \(x\)-axis, other things remaining the same, the flatter is the budget line. For example, if the price of a movie falls from $8 to $4, real income
in terms of soda does not change but the relative price of a movie falls. The budget line rotates outward and becomes flatter, as Fig. 9.2(a) illustrates. The higher the price of the good measured on the x-axis, other things remaining the same, the steeper is the budget line. For example, if the price of a movie rises from $8 to $16, the relative price of a movie increases. The budget line rotates inward and becomes steeper, as Fig. 9.2(a) illustrates.

**A Change in Income** A change in money income changes real income but does not change the relative price. The budget line shifts, but its slope does not change. An increase in money income increases real income and shifts the budget line rightward. A decrease in money income decreases real income and shifts the budget line leftward.

Figure 9.2(b) shows the effect of a change in money income on Lisa’s budget line. The initial budget line when Lisa’s income is $40 is the same as in Fig. 9.1. The new budget line shows how much Lisa can buy if her income falls to $20 a month. The two budget lines have the same slope because the relative price is the same. The new budget line is closer to the origin because Lisa’s real income has decreased.

**FIGURE 9.2** Changes in Prices and Income

![Diagram](image)

(a) A change in price

(b) A change in income

In part (a), the price of a movie changes. A fall in the price from $8 to $4 rotates the budget line outward and makes it flatter. A rise in the price from $8 to $16 rotates the budget line inward and makes it steeper.

In part (b), income falls from $40 to $20 while the prices of movies and soda remain the same. The budget line shifts leftward, but its slope does not change.

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**REVIEW QUIZ**

1. What does a household’s budget line show?
2. How does the relative price and a household’s real income influence its budget line?
3. If a household has an income of $40 and buys only bus rides at $2 each and magazines at $4 each, what is the equation of the household’s budget line?
4. If the price of one good changes, what happens to the relative price and the slope of the household’s budget line?
5. If a household’s money income changes and prices do not change, what happens to the household’s real income and budget line?

You can work these questions in Study Plan 9.1 and get instant feedback. **MyEconLab**

We’ve studied the limits to what a household can consume. Let’s now learn how we can describe preferences and make a map that contains a lot of information about a household’s preferences.
You are going to discover a very cool idea: that of drawing a map of a person’s preferences. A preference map is based on the intuitively appealing idea that people can sort all the possible combinations of goods into three groups: preferred, not preferred, and indifferent. To make this idea more concrete, let’s ask Lisa to tell us how she ranks various combinations of movies and soda.

Figure 9.3 shows part of Lisa’s answer. She tells us that she currently sees 2 movies and buys 6 cases of soda a month at point C. She then lists all the combinations of movies and soda that she says are just as acceptable to her as her current situation. When we plot these combinations of movies and soda, we get the green curve in Fig. 9.3(a). This curve is the key element in a preference map and is called an indifference curve.

An indifference curve is a line that shows combinations of goods among which a consumer is indifferent. The indifference curve in Fig. 9.3(a) tells us that Lisa is just as happy to see 2 movies and buy 6 cases of soda a month at point C as she is to have the combination of movies and soda at point G or at any other point along the curve.

Lisa also says that she prefers all the combinations of movies and soda above the indifference curve in Fig. 9.3(a)—the yellow area—to those on the indifference curve. And she prefers any combination on the indifference curve to any combination in the gray area below the indifference curve.

The indifference curve in Fig. 9.3(a) is just one of a whole family of such curves. This indifference curve appears again in Fig. 9.3(b), labeled I₁. The curves labeled I₀ and I₂ are two other indifference curves. Lisa prefers any point on indifference curve I₂ to any point on indifference curve I₁, and she prefers any point on I₁ to any point on I₀. We refer to I₂ as being a higher indifference curve than I₁ and I₁ as being higher than I₀.

A preference map is a series of indifference curves that resemble the contour lines on a map. By looking at the shape of the contour lines on a map, we can draw conclusions about the terrain. Similarly, by looking at the shape of the indifference curves, we can draw conclusions about a person’s preferences.

Let’s learn how to “read” a preference map.

**FIGURE 9.3 A Preference Map**

Part (a) shows one of Lisa’s indifference curves. She is indifferent between point C (with 2 movies and 6 cases of soda) and all other points on the green indifference curve, such as G. She prefers points above the indifference curve (in the yellow area) to points on it, and she prefers points on the indifference curve to points below it (in the gray area).

Part (b) shows three of the indifference curves—I₀, I₁, and I₂—in Lisa’s preference map. She prefers point J to point C or G, and she prefers all the points on I₂ to those on I₁.
Your Diminishing Marginal Rate of Substitution

Think about your own diminishing marginal rate of substitution. Imagine that in a week, you drink 10 cases of soda and see no movies. Most likely, you are willing to give up a lot of soda so that you can see just 1 movie. But now imagine that in a week, you buy 1 case of soda and see 6 movies. Most likely, you will now not be willing to give up much soda to see a seventh movie. As a general rule, the greater the number of movies you see, the smaller is the quantity of soda you are willing to give up to see one additional movie.

The shape of a person’s indifference curves incorporates the principle of the diminishing marginal rate of substitution because the curves are bowed toward the origin. The tightness of the bend of an indifference curve tells us how willing a person is to substitute one good for another while remaining indifferent. Let’s look at some examples that make this point clear.
**Degree of Substitutability**

Most of us would not regard movies and soda as being close substitutes, but they are substitutes. No matter how much you love soda, some increase in the number of movies you see will compensate you for being deprived of a can of soda. Similarly, no matter how much you love going to the movies, some number of cans of soda will compensate you for being deprived of seeing one movie. A person’s indifference curves for movies and soda might look something like those for most ordinary goods and services shown in Fig. 9.5(a).

**Close Substitutes** Some goods substitute so easily for each other that most of us do not even notice which we are consuming. The different brands of marker pens and pencils are examples. Most people don’t care which brand of these items they use or where they buy them. A marker pen from the campus bookstore is just as good as one from the local grocery store. You would be willing to forgo a pen from the campus store if you could get one more pen from the local grocery store. When two goods are perfect substitutes, their indifference curves are straight lines that slope downward, as Fig. 9.5(b) illustrates. The marginal rate of substitution is constant.

**Complements** Some goods do not substitute for each other at all. Instead, they are complements. The complements in Fig. 9.5(c) are left and right running shoes. Indifference curves of perfect complements are L-shaped. One left running shoe and one right running shoe are as good as one left shoe and two right shoes. Having two of each is preferred to having one of each, but having two of one and one of the other is no better than having one of each.

The extreme cases of perfect substitutes and perfect complements shown here don’t often happen in reality, but they do illustrate that the shape of the indifference curve shows the degree of substitutability between two goods. The closer the two goods are to perfect substitutes, the closer the marginal rate of substitution is to being constant (a straight line), rather than diminishing (a curved line). Indifference curves reveal the degree of substitutability between two goods. Part (a) shows the indifference curves for two ordinary goods: movies and soda. To drink less soda and remain indifferent, one must see more movies. The number of movies that compensates for a reduction in soda increases as less soda is consumed. Part (b) shows the indifference curves for two perfect substitutes. For the consumer to remain indifferent, one fewer marker pen from the local grocery store must be replaced by one extra marker pen from the campus bookstore. Part (c) shows two perfect complements—goods that cannot be substituted for each other at all. Having two left running shoes with one right running shoe is no better than having one of each. But having two of each is preferred to having one of each.

![FIGURE 9.5 The Degree of Substitutability](image-url)
Predicting Consumer Choices

We are now going to predict the quantities of movies and soda that Lisa chooses to buy. We’re also going to see how these quantities change when a price changes or when Lisa’s income changes. Finally, we’re going to see how the substitution effect and the income effect, two ideas that you met in Chapter 3 (see p. 57), guarantee that for a normal good, the demand curve slopes downward.

Best Affordable Choice

When Lisa makes her best affordable choice of movies and soda, she spends all her income and is on her highest attainable indifference curve. Figure 9.6 illustrates this choice: The budget line is from Fig. 9.1 and the indifference curves are from Fig. 9.3(b). Lisa’s best affordable choice is 2 movies and 6 cases of soda at point $C$—the best affordable point.

**FIGURE 9.6  The Best Affordable Choice**

Lisa’s best affordable choice is at point $C$, the point on her budget line and on her highest attainable indifference curve. At point $C$, Lisa’s marginal rate of substitution between movies and soda (the magnitude of the slope of the indifference curve $I_1$) equals the relative price of movies and soda (the slope of the budget line).

The two components of the model of household choice are now in place: the budget line and the preference map. We will now use these components to work out a household’s choice and to predict how choices change when prices and income change.
On the Budget Line  The best affordable point is on the budget line. For every point inside the budget line, such as point $I$, there are points on the budget line that Lisa prefers. For example, she prefers all the points on the budget line between $F$ and $H$ to point $I$, so she chooses a point on the budget line.

On the Highest Attainable Indifference Curve  Every point on the budget line lies on an indifference curve. For example, points $F$ and $H$ lie on the indifference curve $I_0$. By moving along her budget line from either $F$ or $H$ toward $C$, Lisa reaches points on ever-higher indifference curves that she prefers to points $F$ or $H$. When Lisa gets to point $C$, she is on the highest attainable indifference curve.

Marginal Rate of Substitution Equals Relative Price  At point $C$, Lisa’s marginal rate of substitution between movies and soda (the magnitude of the slope of the indifference curve) is equal to the relative price of movies and soda (the magnitude of the slope of the budget line). Lisa’s willingness to pay for a movie equals her opportunity cost of a movie.

Let’s now see how Lisa’s choices change when a price changes.

A Change in Price  The effect of a change in the price of a good on the quantity of the good consumed is called the price effect. We will use Fig. 9.7(a) to work out the price effect of a fall in the price of a movie. We start with the price of a movie at $8, the price of soda at $4 a case, and Lisa’s income at $40 a month. In this situation, she buys 6 cases of soda and sees 2 movies a month at point $C$.

Now suppose that the price of a movie falls to $4. With a lower price of a movie, the budget line rotates outward and becomes flatter. The new budget line is the darker orange one in Fig. 9.7(a). For a refresher on how a price change affects the budget line, check back to Fig. 9.2(a).

Lisa’s best affordable point is now point $J$, where she sees 6 movies and drinks 4 cases of soda. Lisa drinks less soda and watches more movies now that movies are cheaper. She cuts her soda purchases from 6 to 4 cases and increases the number of movies she sees from 2 to 6 a month. When the price of a movie falls and the price of soda and her income remain constant, Lisa substitutes movies for soda.

![Figure 9.7 Price Effect and Demand Curve](image-url)

Initially, Lisa’s best affordable point is $C$ in part (a). If the price of a movie falls from $8 to $4, Lisa’s best affordable point is $J$. The move from $C$ to $J$ is the price effect.

At a price of $8$ a movie, Lisa sees 2 movies a month, at point $A$ in part (b). At a price of $4$ a movie, she sees 6 movies a month, at point $B$. Lisa’s demand curve for movies traces out her best affordable quantity of movies as the price of a movie varies.

MyEconLab animation
Economics in Action

Best Affordable Choice of Movies and DVDs

Between 2005 and 2012, box-office receipts rose by more than 20 percent while the average ticket price increased by only 6 percent. So people must have gone to the movies more often.

Why is movie-going booming? One answer is that the consumer’s experience has improved. Movies in 3-D such as *Dr. Seuss’ The Lorax* play better on the big screen than at home. Also, movie theaters are able to charge a higher price for 3-D films and other big hits, which further boosts receipts. But there is another answer, and at first thought an unlikely one: Events in the market for DVD rentals have impacted going to the movies. To see why, let’s look at the recent history of the DVD rentals market.

Back in 2005, Blockbuster was the main player and the price of a DVD rental was around $4 a night. Redbox was a fledgling. It had started a year earlier with just 140 kiosks in selected McDonald’s restaurants. But Redbox expanded rapidly and by 2007 had as many outlets as Blockbuster. In February 2008, Redbox rented 100 million DVDs at a price of $1 a night.

The easy access to DVDs at $1 a night transformed the markets for movie watching and the figure shows why.

A student has a budget of $40 a month to allocate to movies. To keep the story clear, we’ll suppose that it cost $8 to go to a movie in both 2005 and 2012. The price of a DVD rental in 2005 was $4, so the student’s budget line is the one that runs from 5 movies on the *y*-axis to 10 DVD rentals on the *x*-axis.

The student’s best affordable point is 2 movies and 6 rentals a month.

In 2012, the price of a rental falls to $1 a night but the price of a movie ticket remains at $8. So the budget line rotates outward. The student’s best affordable point is now at 3 movies and 16 rentals a month. (This student loves movies!)

Many other things changed between 2005 and 2012 that influenced the markets for movies and DVD rentals, but the fall in the price of a DVD rental was the biggest influence.
Predicting Consumer Choices

The Demand Curve
In Chapter 3, we asserted that the demand curve slopes downward. We can now derive a demand curve from a consumer’s budget line and indifference curves. By doing so, we can see that the law of demand and the downward-sloping demand curve are consequences of a consumer’s choosing her or his best affordable combination of goods.

To derive Lisa’s demand curve for movies, lower the price of a movie and find her best affordable point at different prices. We’ve just done this for two movie prices in Fig. 9.7(a). Figure 9.7(b) highlights these two prices and two points that lie on Lisa’s demand curve for movies. When the price of a movie is $8, Lisa sees 2 movies a month at point A. When the price falls to $4, she increases the number of movies she sees to 6 a month at point B. The demand curve is made up of these two points plus all the other points that tell us Lisa’s best affordable quantity of movies at each movie price, with the price of soda and Lisa’s income remaining the same. As you can see, Lisa’s demand curve for movies slopes downward—the lower the price of a movie, the more movies she sees. This is the law of demand.

Next, let’s see how Lisa changes her purchases of movies and soda when her income changes.

A Change in Income
The effect of a change in income on buying plans is called the income effect. Let’s work out the income effect by examining how buying plans change when income changes and prices remain constant. Figure 9.8 shows the income effect when Lisa’s income falls. With an income of $40, the price of a movie at $4, and the price of soda at $4 a case, Lisa’s best affordable point is J—she buys 6 movies and 4 cases of soda. If her income falls to $28, her best affordable point is K—she sees 4 movies and buys 3 cases of soda. When Lisa’s income falls, she buys less of both goods. Movies and soda are normal goods.

The Demand Curve and the Income Effect
A change in income leads to a shift in the demand curve, as shown in Fig. 9.8(b). With an income of $40, Lisa’s demand curve for movies is $D_0$, the same as in Fig. 9.7(b). But when her income falls to $28, she plans to see fewer movies at each price, so her demand curve shifts leftward to $D_1$. 

FIGURE 9.8 Income Effect and Change in Demand

(a) Income effect

(b) Demand curve for movies

A change in income shifts the budget line, changes the best affordable point, and changes demand.

In part (a), when Lisa’s income decreases from $40 to $28, she sees fewer movies and buys less soda.

In part (b), when Lisa’s income is $40, her demand curve for movies is $D_0$. When Lisa’s income falls to $28, her demand curve for movies shifts leftward to $D_1$. For Lisa, going to the movies is a normal good. Her demand for movies decreases because she now sees fewer movies at each price.
### Substitution Effect and Income Effect

For a normal good, a fall in its price always increases the quantity bought. We can prove this assertion by dividing the price effect into two parts:

- Substitution effect
- Income effect

Figure 9.9(a) shows the price effect and Figs. 9.9(b) and 9.9(c) show the two parts into which we separate the price effect.

**Substitution Effect**  The substitution effect is the effect of a change in price on the quantity bought when the consumer (hypothetically) remains indifferent between the original situation and the new one. To work out Lisa’s substitution effect when the price of a movie falls, we must lower her income by enough to keep her on the same indifference curve as before.

Figure 9.9(a) shows the price effect of a fall in the price of a movie from $8 to $4. The number of movies increases from 2 to 6 a month. When the price falls, suppose (hypothetically) that we cut Lisa’s income to $28. What’s special about $28? It is the income that is just enough, at the new price of a movie, to keep Lisa’s best affordable point on the same indifference curve ($I_1$) as her original point $C$. Lisa’s budget line is now the medium orange line in Fig. 9.9(b). With the lower price of a movie and a smaller income, Lisa’s best affordable point is $K$. The move from $C$ to $K$ along indifference curve $I_1$ is the substitution effect of the price change. The substitution effect of the fall in the price of a movie is an increase in the quantity of movies from 2 to 4. The direction of the substitution effect never varies: When the relative price of a good falls, the consumer substitutes more of that good for the other good.

**Income Effect** To calculate the substitution effect, we gave Lisa a $12 pay cut. To calculate the income effect, we give Lisa back her $12. The $12 increase in income shifts Lisa’s budget line outward, as shown in Fig. 9.9(c). The slope of the budget line does not change because both prices remain the same. This change in Lisa’s budget line is similar to the one illustrated in Fig. 9.8. As Lisa’s budget line shifts outward, her consumption possibilities expand and her best afford-

### FIGURE 9.9  Substitution Effect and Income Effect

![Diagram](image-url)

When the price of a movie falls from $8 to $4, Lisa moves from point $C$ to point $J$ in part (a). The price effect is an increase in the number of movies from 2 to 6 a month. This price effect is separated into a substitution effect in part (b) and an income effect in part (c).

To isolate the substitution effect, we confront Lisa with the new price but keep her on her original indifference curve, $I_1$. The substitution effect is the move from $C$ to $K$ along indifference curve $I_1$—an increase from 2 to 4 movies a month.
able point becomes \( J \) on indifference curve \( I_2 \). The move from \( K \) to \( J \) is the income effect of the price change.

As Lisa’s income increases, she sees more movies. For Lisa, a movie is a normal good. For a normal good, the income effect reinforces the substitution effect. Because the two effects work in the same direction, we can be sure that the demand curve slopes downward. But some goods are inferior goods. What can we say about the demand for an inferior good?

**Inferior Goods**  Recall that an inferior good is a good for which demand decreases when income increases. For an inferior good, the income effect is negative, which means that a lower price does not inevitably lead to an increase in the quantity demanded. The substitution effect of a fall in the price increases the quantity demanded, but the negative income effect works in the opposite direction and offsets the substitution effect to some degree. The key question is to what degree.

If the negative income effect equals the positive substitution effect, a fall in price leaves the quantity bought the same. When a fall in price leaves the quantity demanded unchanged, the demand curve is vertical and demand is perfectly inelastic.

If the negative income effect is smaller than the positive substitution effect, a fall in price increases the quantity bought and the demand curve still slopes downward like that for a normal good. But the demand for an inferior good might be less elastic than that for a normal good.

If the negative income effect exceeds the positive substitution effect, a fall in the price decreases the quantity bought and the demand curve slopes upward. This case does not appear to occur in the real world.

You can apply the indifference curve model that you’ve studied in this chapter to explain the changes in the way we buy recorded music, see movies, and make all our other consumption choices. We allocate our budgets to make our best affordable choices. Changes in prices and incomes change our best affordable choices and change consumption patterns.

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**REVIEW QUIZ**

1. When a consumer chooses the combination of goods and services to buy, what is she or he trying to achieve?
2. Explain the conditions that are met when a consumer has found the best affordable combination of goods to buy. (Use the terms budget line, marginal rate of substitution, and relative price in your explanation.)
3. If the price of a normal good falls, what happens to the quantity demanded of that good?
4. Into what two effects can we divide the effect of a price change?
5. For a normal good, does the income effect reinforce the substitution effect or does it partly offset the substitution effect?

You can work these questions in Study Plan 9.3 and get instant feedback. 

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**Reading Between the Lines** on pp. 214–215 shows you how the theory of household choice explains why e-books are taking off and how people chose whether to buy their books in electronic or paper format.

In the chapters that follow, we study the choices that firms make in their pursuit of profit and how those choices determine the supply of goods and services and the demand for productive resources.
“The whole book culture is changing . . .”

The device at the bottom of this change is an 8-by-5-inch gadget on which you can read—and buy—books. e-readers, and tablets such as the iPad, can make reading a multimedia experience: Imagine reading a book on The Beatles while a video of them on “The Ed Sullivan Show” appears beside the text. It can also make bookstores a cemetery.

“We’re seeing triple-digit percentage growth in e-books from last year,” says Andi Sporkin for the Association of American Publishers.

“There is a massive change in this business due to e-book technology,” says Mitch Kaplan, owner of the Coral Gables, Fla.-based Books & Books. “And it’s happened faster than I could ever have imagined. A couple of years ago, e-books were maybe 2 percent of the business. Now we think it will be 25 percent by the end of the year, and there’s no end in sight yet.”

e-readers went on the market in the 1990s. High prices ($400 and up), clumsy technology, and a general skepticism about the technology relegated them to the fringe. Only in 2007, after the launch of the Amazon Kindle and the Sony Reader—which both used a new technology, e-ink, to make their text more booklike—did consumers get on board. Sales of e-books rocketed, from about $32 million in 2006 to $441 million in 2010, an expected to top $1 billion this year. . . .

ESSENCE OF THE STORY

- e-readers and tablets are changing book buying and reading.
- e-readers of the 1990s had high prices ($400 and up) and were clumsy.
- Today’s e-readers use an e-ink technology and are more booklike.
- Sales of e-books increased from $32 million in 2006 to $441 million in 2010, to more than $1 billion in 2011—triple-digit percentage growth.
ECONOMIC ANALYSIS

- e-books are selling in rapidly growing numbers because of the choices that millions of consumers are making. One of these consumers is Andy.

- Andy loves reading, but he also enjoys music. And his budget for books and music is limited. So he must choose among the many alternative combinations of books and albums that he can afford.

- Figure 1 shows Andy’s indifference curves for books (of all types) and albums.

- Andy’s annual budget for albums and books is $600. The price of an album is $10, the price of a print book is $25, and the price of an e-book is $14.

- Figure 1 shows two budget lines: one if Andy buys print books and albums and another if he buys e-books and albums.

- In Fig. 1, the price of the most basic e-book reader is $200. Andy must spend this amount on a reader if he is to buy e-books, which leaves him with $400 for albums and e-books. If he buys 10 e-books, he can afford 26 albums [(10 × $14) + (26 × $10) = $400].

- If Andy buys print books and albums, he can afford 14 print books and 25 albums [(14 × $25) + (25 × $10) = $600].

- This combination is Andy’s best affordable choice — 14 print books and 25 albums shown at point A. Andy, doesn’t buy e-books.

- Now the price of an e-book reader falls, and today Andy can buy the same basic reader that previously cost $200 for $80.

- Figure 2 shows what happens to Andy’s budget line and his choices.

- If Andy buys print books and albums, nothing changes. He can still afford 14 print books and 25 albums [(14 × $25) + (25 × $10) = $600].

- But if he buys e-books, his situation has changed. After spending $80 on an e-book reader, Andy is left with $520 for albums and e-books. If he buys 14 e-books he can now afford 32 albums [(14 × $14) + (32 × $10) = $516 (he has $4 change)].

- Andy can now afford more albums if he buys the same number of books that he bought when the reader cost $200. But that’s not Andy’s best affordable combination of albums and books.

- The price of an e-book is lower than the price of a print book, so for Andy the relative price of a book has fallen and he can benefit by substituting books for albums.

- Andy moves along his budget line to the point at which his marginal rate of substitution of books for albums equals the relative price.

- This point occurs at B where Andy buys 18 e-books and 27 albums [(18 × $14) + (27 × $10) = $522 (he spends $2 less on gum)].

- The changing “book culture” is the consequence of Andy and other rational consumers responding to the incentive of a change in relative prices.
CHAPTER 9 Possibilities, Preferences, and Choices

Key Points

Consumption Possibilities (pp. 202–204)
- The budget line is the boundary between what a household can and cannot afford, given its income and the prices of goods.
- The point at which the budget line intersects the y-axis is the household’s real income in terms of the good measured on that axis.
- The magnitude of the slope of the budget line is the relative price of the good measured on the x-axis in terms of the good measured on the y-axis.
- A change in the price of one good changes the slope of the budget line. A change in income shifts the budget line but does not change its slope.

Working Problems 1 to 10 will give you a better understanding of consumption possibilities.

Preferences and Indifference Curves (pp. 205–208)
- A consumer’s preferences can be represented by indifference curves. The consumer is indifferent among all the combinations of goods that lie on an indifference curve.
- A consumer prefers any point above an indifference curve to any point on it and prefers any point on an indifference curve to any point below it.
- The magnitude of the slope of an indifference curve is called the marginal rate of substitution.
- The marginal rate of substitution diminishes as consumption of the good measured on the y-axis decreases and consumption of the good measured on the x-axis increases.

Working Problems 11 to 15 will give you a better understanding of preferences and indifference curves.

Predicting Consumer Choices (pp. 208–213)
- A household consumes at its best affordable point. This point is on the budget line and on the highest attainable indifference curve and has a marginal rate of substitution equal to relative price.
- The effect of a price change (the price effect) can be divided into a substitution effect and an income effect.
- The substitution effect is the effect of a change in price on the quantity bought when the consumer (hypothetically) remains indifferent between the original choice and the new choice.
- The income effect is the effect of a change in income on consumption.
- For a normal good, the income effect reinforces the substitution effect. For an inferior good, the income effect works in the opposite direction to the substitution effect.

Working Problems 16 to 20 will give you a better understanding of predicting consumer choices.

Key Terms

Budget line, 202
Diminishing marginal rate of substitution, 206
Income effect, 211
Indifference curve, 205
Marginal rate of substitution, 206
Price effect, 209
Relative price, 203
Real income, 203
Substitution effect, 212
Preferences and Indifference Curves (Study Plan 9.2)

11. Draw figures that show your indifference curves for the following pairs of goods:
   - Right gloves and left gloves
   - Coca-Cola and Pepsi
   - Tylenol and acetaminophen (the generic form of Tylenol)
   - Desktop computers and laptop computers
   - Strawberries and ice cream

   For each pair, are the goods perfect substitutes, perfect complements, substitutes, complements, or unrelated?

12. Discuss the shape of the indifference curve for each of the following pairs of goods:
   - Orange juice and smoothies
   - Baseballs and baseball bats
   - Left running shoe and right running shoe
   - Eyeglasses and contact lenses

   Explain the relationship between the shape of the indifference curve and the marginal rate of substitution as the quantities of the two goods change.

Use the following news clip to work Problems 13 and 14.

The Year in Medicine

Sudafed, used by allergy sufferers, contains as the active ingredient pseudoephedrine, which is widely used to make home-made methamphetamine. Allergy sufferers looking to buy Sudafed must now show photo ID and sign a logbook. The most common alternative, phenylephrine, isn’t as effective as pseudoephedrine.

Source: *Time*, December 4, 2006

13. Sketch an indifference curve for Sudafed and phenylephrine that is consistent with this news clip. On your graph, identify combinations that allergy sufferers prefer, do not prefer, and are indifferent among.

14. Explain how the marginal rate of substitution changes as an allergy sufferer increases the consumption of Sudafed.
Use the following news clip to work Problems 15 and 16.

**Gas Prices to Stunt Memorial Day Travel**
With high gas prices, 12% of the people surveyed say that they have cancelled their Memorial Day road trip and 11% will take a trip near home. That may save consumers some money, but it will also likely hurt service stations, which will sell less gas and fewer snacks and hurt roadside hotels, which will have fewer rooms used and serve fewer meals.

Source: MarketWatch, May 22, 2008

15. Describe the degree of substitutability between Memorial Day trips and other trip-related goods and services and sketch a consumer’s preference map that illustrates your description.

**Predicting Consumer Choices** (Study Plan 9.3)

16. a. Sketch a consumer’s preference map between Memorial Day trips and other goods and services. Draw a consumer’s budget line prior to the rise in the price of gasoline and mark the consumer’s best affordable point.

b. On your graph, show how the best affordable point changes when the price of gasoline rises.

Use the following information to work Problems 17 and 18.

Pam has made her best affordable choice of cookies and granola bars. She spends all of her weekly income on 30 cookies at $1 each and 5 granola bars at $2 each. Next week, she expects the price of a cookie to fall to 50¢ and the price of a granola bar to rise to $5.

17. a. Will Pam be able to buy and want to buy 30 cookies and 5 granola bars next week?

b. Which situation does Pam prefer: cookies at $1 and granola bars at $2 or cookies at 50¢ and granola bars at $5?

18. a. If Pam changes how she spends her weekly income, will she buy more or fewer cookies and more or fewer granola bars?

b. When the prices change next week, will there be an income effect, a substitution effect, or both at work?

Use the following information to work Problems 19 and 20.

**Boom Time For “Gently Used” Clothes**
Most retailers are blaming the economy for their poor sales, but one store chain that sells used name-brand children’s clothes, toys, and furniture is boldly declaring that an economic downturn can actually be a boon for its business. Last year, the company took in $20 million in sales, up 5% from the previous year. Sales are already up 5% this year.

Source: CNN, April 17, 2008

19. a. According to the news clip, is used clothing a normal good or an inferior good?

b. If the price of used clothing falls and income remains the same, explain how the quantity of used clothing bought changes.

c. If the price of used clothing falls and income remains the same, describe the substitution effect and the income effect that occur.

20. a. Use a graph to illustrate a family’s indifference curves for used clothing and other goods and services.

b. In your graph in part (a), draw two budget lines to show the effect of a fall in income on the quantity of used clothing purchased.

**Economics in the News** (Study Plan 9.N)

Use the following information to work Problems 21 and 22.

**Gas Prices Send Surge of Travelers to Mass Transit**
With the price of gas approaching $4 a gallon, more commuters are abandoning their cars and taking the train or bus. It’s very clear that a significant portion of the increase in transit use is directly caused by people who are looking for alternatives to paying $3.50 a gallon for gas. Some cities with long-established public transit systems, like New York and Boston, have seen increases in ridership of 5 percent, but the biggest surges—of 10 to 15 percent over last year—are occurring in many metropolitan areas in the Southwest where the driving culture is strongest and bus and rail lines are more limited.


21. a. Sketch a graph of a preference map and a budget line to illustrate the best affordable combination of gasoline and public transit.

b. On your graph show the effect of a rise in the price of gasoline on the quantities of gasoline and public transit services purchased.

22. If the gas price rise has been similar in all regions, compare the marginal rates of substitution in the Northeast and the Southwest. Explain how you have inferred the different marginal rates of substitution from the information in the news clip.
31. a. Sketch a budget line for a household that spends its income on only two goods: gasoline and restaurant meals. Identify the combinations of gasoline and restaurant meals that are affordable and those that are unaffordable.

b. Sketch a second budget line to show how a rise in the price of gasoline changes the affordable and unaffordable combinations of gasoline and restaurant meals. Describe how the household’s consumption possibilities change.

32. How does a rise in the price of gasoline change the relative price of a restaurant meal? How does a rise in the price of gasoline change real income in terms of restaurant meals?

Preferences and Indifference Curves

Use the following information to work Problems 33 and 34.

Rashid buys only books and CDs and the figure shows his preference map.

33. a. If Rashid chooses 3 books and 2 CDs, what is his marginal rate of substitution?

b. If Rashid chooses 2 books and 6 CDs, what is his marginal rate of substitution?

34. Do Rashid’s indifference curves display diminishing marginal rate of substitution? Explain why or why not.

Gas Prices Straining Budgets

With gas prices rising, many people say they are staying in and scaling back spending to try to keep within their budget. They are driving as little as possible, cutting back on shopping and eating out, and reducing other discretionary spending.

Source: CNN, February 29, 2008
35. **You May Be Paid More (or Less) Than You Think**

It’s so hard to put a price on happiness, isn’t it? But if you’ve ever had to choose between a job you like and a better-paying one that you like less, you probably wished some economist would tell you how much job satisfaction is worth. Trust in management is by far the biggest component to consider. Say you get a new boss and your trust in management goes up a bit (say, up 1 point on a 10-point scale). That’s like getting a 36 percent pay raise. In other words, that increased level of trust will boost your level of overall satisfaction in life by about the same amount as a 36 percent raise would.

Source: CNN, March 29, 2006

a. Measure trust in management on a 10-point scale, measure pay on the same 10-point scale, and think of them as two goods. Sketch an indifference curve (with trust on the x-axis) that is consistent with the news clip.

b. What is the marginal rate of substitution between trust in management and pay according to this news clip?

c. What does the news clip imply about the principle of diminishing marginal rate of substitution? Is that implication likely to be correct?

### Predicting Consumer Choices

Use the following information to work Problems 36 and 37.

Jim has made his best affordable choice of muffins and coffee. He spends all of his income on 10 muffins at $1 each and 20 cups of coffee at $2 each. Now the price of a muffin rises to $1.50 and the price of coffee falls to $1.75 a cup.

36. a. Will Jim now be able and want to buy 10 muffins and 20 coffees?

b. Which situation does Jim prefer: muffins at $1 and coffee at $2 a cup or muffins at $1.50 and coffee at $1.75 a cup?

37. a. If Jim changes the quantities that he buys, will he buy more or fewer muffins and more or less coffee?

b. When the prices change, will there be an income effect, a substitution effect, or both at work?

### Use the following information to work Problems 38 to 40.

Sara’s income is $12 a week. The price of popcorn is $3 a bag, and the price of cola is $1.50 a can. The figure shows Sara’s preference map for popcorn and cola.

38. What quantities of popcorn and cola does Sara buy? What is Sara’s marginal rate of substitution at the point at which she consumes?

39. Suppose that the price of cola rises to $3.00 a can and the price of popcorn and Sara’s income remain the same. What quantities of cola and popcorn does Sara now buy? What are two points on Sara’s demand curve for cola? Draw Sara’s demand curve.

40. Suppose that the price of cola rises to $3.00 a can and the price of popcorn and Sara’s income remain the same.

a. What is the substitution effect of this price change and what is the income effect of the price change?

b. Is cola a normal good or an inferior good? Explain.

### Economics in the News

41. After you have studied Reading Between the Lines on pp. 214–215, answer the following questions.

a. How do you buy books?

b. Sketch your budget line for books and other goods.

c. Sketch your indifference curves for books and other goods.

d. Identify your best affordable point.
Making the Most of Life

The powerful forces of demand and supply shape the fortunes of families, businesses, nations, and empires in the same unrelenting way that the tides and winds shape rocks and coastlines. You saw in Chapters 3 through 7 how these forces raise and lower prices, increase and decrease quantities bought and sold, cause revenues to fluctuate, and send resources to their most valuable uses.

These powerful forces begin quietly and privately with the choices that each one of us makes. Chapters 8 and 9 probe these individual choices, offering two alternative approaches to explaining both consumption plans and the allocation of time. These explanations of consumption plans can also explain “non-economic” choices, such as whether to marry and how many children to have. In a sense, there are no non-economic choices. If there is scarcity, there must be choice, and economics studies all choices.

The earliest economists (Adam Smith and his contemporaries) did not have a very deep understanding of households’ choices. It was not until the nineteenth century that progress was made in this area when Jeremy Bentham (below) introduced the concept of utility and applied it to the study of human choices. Today, Steven Levitt, whom you will meet on the following page, is one of the most influential students of human behavior.

Jeremy Bentham (1748–1832), who lived in London, was the son and grandson of lawyers and was himself trained as a barrister. But Bentham rejected the opportunity to maintain the family tradition and, instead, spent his life as a writer, activist, and Member of Parliament in the pursuit of rational laws that would bring the greatest happiness to the greatest number of people.

Bentham, whose embalmed body is preserved to this day in a glass cabinet in the University of London, was the first person to use the concept of utility to explain human choices. But in Bentham’s day, the distinction between explaining and prescribing was not a sharp one, and Bentham was ready to use his ideas to tell people how they ought to behave. He was one of the first to propose pensions for the retired, guaranteed employment, minimum wages, and social benefits such as free education and free medical care.

“… It is the greatest happiness of the greatest number that is the measure of right and wrong.”

JEREMY BENTHAM
Fragment on Government
Why did you become an economist?
As a freshman in college, I took introductory economics. All the ideas made perfect sense to me—it was the way I naturally thought. My friends were befuddled. I thought, “This is the field for me!”

The idea of rational choice made at the margin lies at the heart of economics. Would you say that your work generally supports that idea or challenges it? Can you provide some examples?
I don’t like the word “rational” in this context. I think economists model agents as being rational just for convenience. What really matters is whether people respond to incentives. My work very much supports the idea that humans in all types of circumstances respond strongly to incentives. I’ve seen it with drug dealers, auto thieves, sumo wrestlers, real estate agents, and elementary school teachers, just to name a few examples.

Drug dealers, for instance, want to make money, but they also want to avoid being arrested or even killed. In the data we have on drug sellers, we see that when the drug trade is more lucrative, dealers are willing to take greater risks of arrest to carve out a share of the market…. Sumo wrestlers, on the other hand, care mostly about their official ranking. Sometimes matches occur where one wrestler has more to lose or gain than the other wrestler. We find that sumo wrestlers make corrupt deals to make sure the wrestler who wins is the one who needs to win.

Why is an economist interested in crime and cheating?
I think of economics as being primarily about a way of looking at the world and a set of tools for thinking clearly. The topics you apply these tools to are unlimited. That is why I think economics has been so powerful. If you understand economics and use the tools wisely, you will be a better business person, doctor, public servant, parent.

*Read the full interview with Steven Levitt in MyEconLab.

STEVEN D. LEVITT is William B. Ogden Distinguished Service Professor of Economics at the University of Chicago. Born in Minneapolis, he was an undergraduate at Harvard and a graduate student at MIT. Among his many honors, he was recently awarded the John Bates Clark Medal, given to the best economist under 40.

Professor Levitt has studied an astonishingly wide range of human choices and their outcomes. He has examined the effects of policing on crime, shown that real estate agents get a higher price when they sell their own homes than when they sell other people’s, devised a test to detect cheating teachers, and studied the choices of drug dealers and gang members. Much of this research has been popularized in Freakonomics (Steven D. Levitt and Stephen J. Dubner, HarperCollins, 2005). What unifies this apparently diverse body of research is the use of natural experiments. Professor Levitt has an incredible ability to find just the right set of events and the data the events have generated to enable him to isolate the effect he’s looking for.

Michael Parkin talked with Steven Levitt about his work and what economists have discovered about how people respond to incentives.