In this chapter, we introduce five key principles that provide a foundation for economic analysis. A **principle** is a self-evident truth that most people readily understand and accept. For example, most people readily accept the principle of gravity. As you read through the book, you will see the five key principles of economics again and again as you do your own economic analysis.

## 2.1 The Principle of Opportunity Cost

Economics is all about making choices, and to make good choices we must compare the benefit of something to its cost. **Opportunity cost** incorporates the notion of scarcity: No matter what we do, there is always a trade-off. We must trade off one thing for another because resources are limited and can be used in different ways. By acquiring something, we use up resources that could have been used to acquire something else. The notion of opportunity cost allows us to measure this trade-off.

### Principle of Opportunity Cost

The opportunity cost of something is what you sacrifice to get it.

In most decisions we choose from several alternatives. For example, if you spend an hour studying for an economics exam, you have one less hour to pursue other activities. To determine the opportunity cost of an activity, we look at what you consider the best of these “other” activities. For example, suppose the alternatives to studying economics are studying for a history exam or working in a job that pays $10 per hour.

If you consider studying for history a better use of your time than working, then the opportunity cost of studying economics is the four extra points you could have received on a history exam if you studied history instead of economics. Alternatively, if working is the best alternative, the opportunity cost of studying economics is the $10 you could have earned instead.

We can also apply the principle of opportunity cost to decisions about how to spend money from a fixed budget. For example, suppose that you have a fixed budget to spend on music. You can buy your music either at a local music store for $15 per CD or online for $1 per song. The opportunity cost of 1 CD is 15 one-dollar online songs. A hospital with a fixed salary budget can increase the number of doctors only at the expense of nurses or physician’s assistants. If a doctor costs five times as much as a nurse, the opportunity cost of a doctor is five nurses.

In some cases, a product that appears to be free actually has a cost. That’s why economists are fond of saying, “There’s no such thing as a free lunch.” Suppose someone offers to buy you lunch if you agree to listen to a sales pitch for a time-share condominium. Although you don’t pay any money for the lunch, there is an opportunity cost because you could spend that time in another way—such as studying for your economics or history exam. The lunch isn’t free because you sacrifice an hour of your time to get it.

### The Cost of College

What is the opportunity cost of a college degree? Consider a student who spends a total of $40,000 for tuition and books. Instead of going to college, the student could have spent this money on a wide variety of goods, including housing, electronic devices, and world travel. Part of the opportunity cost of college is the $40,000 worth of other goods the student sacrifices to pay for tuition and books. Also, instead of going to college, the student could have worked as a bank clerk for $20,000 per year.
and earned $80,000 over four years. That makes the total opportunity cost of this student's college degree $120,000:

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Opportunity cost of money spent on tuition and books</td>
<td>$40,000</td>
</tr>
<tr>
<td>Opportunity cost of college time (four years working for $20,000 per year)</td>
<td>$40,000</td>
</tr>
<tr>
<td>Economic cost or total opportunity cost</td>
<td>$120,000</td>
</tr>
</tbody>
</table>

We haven't included the costs of food or housing in our computations of opportunity cost. That's because a student must eat and live somewhere even if he or she doesn't go to college. But if housing and food are more expensive in college, then we would include the extra costs of housing and food in our calculations.

There are other things to consider in a person's decision to attend college. As we'll see later, a college degree can increase a person's earning power, so there are benefits from a college degree. In addition, college offers the thrill of learning and the pleasure of meeting new people. To make an informed decision about whether to attend college, we must compare the benefits to the opportunity costs.

**Opportunity Cost and the Production Possibilities Curve**

Just as individuals face limits, so do entire economies. As we saw in Chapter 1, the ability of an economy to produce goods and services is determined by its factors of production, including labor, natural resources, physical capital, human capital, and entrepreneurship.

Figure 2.1 shows a production possibilities graph for an economy that produces wheat and steel. The horizontal axis shows the quantity of wheat produced by the economy, and the vertical axis shows the quantity of steel produced. The shaded area shows all the possible combinations of the two goods the economy can produce. At point a, for example, the economy can produce 700 tons of steel and 10 tons of wheat. In contrast, at point c, the economy can produce 300 tons of steel and 20 tons of wheat. The set of points on the border between the shaded and unshaded area is called the production possibilities curve (or production possibilities frontier), because it separates the combinations that are attainable from those that are not. The attainable combinations are shown by the shaded area within the curve and the curve itself. The unattainable combinations are shown by the unshaded area outside the curve. The points on the curve show the combinations that are possible if the economy's resources are fully employed.

**FIGURE 2.1**

Scarcity and the Production Possibilities Curve

The production possibilities curve illustrates the principle of opportunity cost for an entire economy. An economy has a fixed amount of resources. If these resources are fully employed, an increase in the production of wheat comes at the expense of steel.
APPLICATION

DON'T FORGET THE COSTS OF TIME AND INVESTED FUNDS

APPLYING THE CONCEPTS #1: What is the opportunity cost of running a business?

Betty has a degree in fine arts, and makes a unique product—decorative bottle-cap pins. She paints recycled bottle caps with attractive images, and attaches a pin so the bottle caps can be displayed on sweaters or jackets. She has asked you to compute the annual cost of her business. She uses machines and tools that have a current market value of $10,000. The annual cost of her raw materials (bottle caps, paint, pins) is $2,000. She could be earning $30,000 in another job.

We can use the principle of opportunity cost to compute Betty's costs. In addition to the $2,000 cost of raw materials, we must include two other sorts of costs:

- **Opportunity cost of funds invested.** Betty could have invested the $10,000 in a bank account. If the interest rate on a bank account is 8 percent, the annual cost of her capital (machines and tools) is the $800 she could have earned in a bank account during the year.

- **Opportunity cost of her time.** The opportunity cost of Betty's time is the $30,000 salary she sacrifices by being her own boss.

Adding the $800 cost of funds and the $30,000 cost of her time to the $2,000 materials cost, we find Betty's cost of doing business is $32,800 per year. Related to Exercise 1.6.

The production possibilities curve illustrates the notion of opportunity cost. If an economy is fully utilizing its resources, it can produce more of one product only if it produces less of another product. For example, to produce more wheat, we must take resources away from steel. As we move resources out of steel, the quantity of steel produced will decrease. For example, if we move from point $a$ to point $b$ along the production possibilities curve in Figure 2.1, we sacrifice 50 tons of steel (700 tons = 650 tons) to get 10 more tons of wheat (20 tons = 10 tons). Further down the curve, if we move from point $c$ to point $d$, we sacrifice 180 tons of steel to get the same 10-ton increase in wheat.

Why is the production possibilities curve bowed outward, with the opportunity cost of wheat increasing as we move down the curve? The reason is that resources are not perfectly adaptable for the production of both goods. Some resources are more suitable for steel production, while others are more suitable for wheat production. Starting at point $a$, the economy uses its most fertile land to produce wheat. A 10-ton increase in wheat reduces the quantity of steel by only 50 tons, because plenty of fertile land is available for conversion to wheat farming. As the economy moves downward along the production possibilities curve, farmers will be forced to use land that is progressively less fertile, so to increase wheat output by 10 tons, more and more resources must be diverted from steel production. In the move from point $c$ to point $d$, the land converted to farming is so poor that increasing wheat output by 10 tons decreases steel output by 180 tons.

The production possibilities curve shows the production options for a given set of resources. As shown in Figure 2.2, an increase in the amount of resources available to the economy shifts the production possibilities outward. For example, if we start at point $f$, and the economy's resources increase, we can produce more steel (point $g$), more wheat (point $h$), or more of both goods (points between $g$ and $h$). The curve will also shift outward as a result of technological innovations that enable us to produce more output with a given quantity of resources.
2.2 THE MARGINAL PRINCIPLE

Economics is about making choices, and we rarely make all-or-nothing choices. For example, if you sit down to read a book, you don’t read the entire book in a single sitting, but instead decide how many pages or chapters to read. Economists think in marginal terms, considering how a one-unit change in one variable affects the value of another variable and people’s decisions. When we say marginal, we’re looking at the effect of a small, or incremental, change.

The marginal principle is based on a comparison of the marginal benefits and marginal costs of a particular activity. The marginal benefit of an activity is the additional benefit resulting from a small increase in the activity. For example, the marginal benefit of keeping a bookstore open for one more hour equals the additional revenue from book sales. Similarly, the marginal cost is the additional cost resulting from a small increase in the activity. For example, the marginal cost of keeping a bookstore open for one more hour equals the additional expenses for workers and utilities for that hour. Applying the marginal principle, the bookstore should stay open for one more hour if the marginal benefit (the additional revenue) is at least as large as the marginal cost (the additional cost). For example, if the marginal benefit is $80 of additional revenue and the marginal cost is $30 of additional expense for workers and utilities, staying open for the additional hour increases the bookstore’s profit by $50.

**Marginal Principle**

Increase the level of an activity as long as its marginal benefit exceeds its marginal cost. Choose the level at which the marginal benefit equals the marginal cost.

Thinking at the margin enables us to fine-tune our decisions. We can use the marginal principle to determine whether a one-unit increase in a variable would make...
APPLICATION 2

THE OPPORTUNITY COST OF MILITARY SPENDING

APPLYING THE CONCEPTS #2: What are society's trade-offs between different goods?

We can use the principle of opportunity cost to explore the cost of military spending. In 1992, Malaysia bought two warships. For the price of the warships, the country could have built a system to provide safe drinking water for 5 million citizens who lacked it. In other words, the opportunity cost of the warships was safe drinking water for 5 million people. The policy question is whether the benefits of the warships exceed their opportunity cost.

In the United States, economists have estimated that the cost of the war in Iraq will be at least $1 trillion. The economists' calculations go beyond the simple budgetary costs and quantify the opportunity cost of the war. For example, the resources used in the war could have been used in various government programs for children—to enroll more children in preschool programs, to hire more science and math teachers to reduce class sizes, or to immunize more children in poor countries. For example, each $100 billion spent on the war could instead support one of the following programs:

- Enroll 13 million preschool children in the Head Start program for one year.
- Hire 1.8 million additional teachers for one year.
- Immunize all the children in less-developed countries for the next 33 years.

The fact that the war had a large opportunity cost does not necessarily mean that it was unwise. The policy question is whether the benefits from the war exceed its opportunity cost. Taking another perspective, we can measure the opportunity cost of war in terms of its implications for domestic security. The resources used in the war in Iraq could have been used to improve domestic security by securing ports and cargo facilities, hiring more police officers, improving the screening of airline passengers and baggage, improving fire departments and other first responders, upgrading the Coast Guard fleet, and securing our railroad and highway systems. The cost of implementing the domestic-security recommendations of various government commissions would be about $31 billion, a small fraction of the cost of the war. The question for policy makers is whether money spent on domestic security would be more beneficial than money spent on the war. Related to Exercises 1.5 and 1.7.


How Many Movie Sequels?

To illustrate the marginal principle, let's consider movie sequels. When a movie is successful, its producer naturally thinks about doing another movie, continuing the story line with the same set of characters. If the first sequel is successful too, the producer
thinks about producing a second sequel, then a third, and so on. We can use the marginal principle to explore the decision of how many movies to produce.

Figure 2.3 shows the marginal benefits and marginal costs for movies. On the benefit side, a movie sequel typically generates about 30 percent less revenue than the original movie, and revenue continues to drop for additional movies. In the second column of the table, the first movie generates $300 million in revenue, the second generates $210 million, and the third generates $135 million. This is shown in the graph as a negatively sloped marginal-benefit curve, with the marginal benefit decreasing from $300 for the first movie (point a), to $210 (point b), and then to $135 (point c). On the cost side, the typical movie in the United States costs about $50 million to produce and about $75 million to promote. In the third column of the table, the cost of the first movie (the original) is $125 million. In the graph, this is shown as point d on the marginal-cost curve. The marginal cost increases with the number of movies because film stars typically demand higher salaries to appear in sequels. In the table and the graph, the marginal cost increases to $150 million for the second movie (point e) and to $175 million for the third (point f).

<table>
<thead>
<tr>
<th>Number of Movies</th>
<th>Marginal Benefit ($ millions)</th>
<th>Marginal Cost ($ millions)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>300</td>
<td>125</td>
</tr>
<tr>
<td>2</td>
<td>210</td>
<td>150</td>
</tr>
<tr>
<td>3</td>
<td>135</td>
<td>175</td>
</tr>
</tbody>
</table>

**FIGURE 2.3**

The Marginal Principle and Movie Sequels

The marginal benefit of movies in a series decreases because revenue falls off with each additional movie, while the marginal cost increases because actors demand higher salaries. The marginal benefit exceeds the marginal cost for the first two movies, so it is sensible to produce two, but not three, movies.

In this example, the first two movies are profitable, but the third is not. For the original movie, the marginal benefit ($300 million at point a) exceeds the marginal cost ($125 million at point d), generating a profit of $175 million. Although the second movie has a higher cost and a lower benefit, it is profitable because the marginal benefit still exceeds the marginal cost, so the profit on the second movie is
$60 million ($210 million – $150 million). In contrast, the marginal cost of the third movie of $175 million exceeds its marginal benefit of only $135 million, so the third movie loses $40 million. In this example, the movie producer should stop after the second movie.

Although this example shows that only two movies are profitable, other outcomes are possible. If the revenue for the third movie were larger, making the marginal benefit greater than the marginal cost, it would be sensible to produce the third movie. Similarly, if the marginal cost of the third movie were lower—if the actors didn’t demand such high salaries—the third movie could be profitable. Many movies have had multiple sequels, such as Harry Potter and the Sorcerer’s Stone and Star Wars. Conversely, many profitable movies, such as Wedding Crashers and Groundhog Day, didn’t result in any sequels. In these cases, the expected drop-off in revenues and run-up in costs for the second movie were large enough to make a sequel unprofitable.

Renting College Facilities

Suppose that your student film society is looking for an auditorium to use for an all-day Hitchcock film program and is willing to pay up to $200. Your college has a new auditorium that has a daily rent of $450, an amount that includes $300 to help pay for the cost of building the auditorium, $50 to help pay for insurance, and $100 to cover the extra costs of electricity and janitorial services for a one-day event. If your film society offers to pay $150 for using the auditorium, should the college accept the offer? The college could use the marginal principle to make the decision.

To decide whether to accept your group’s offer, the college should determine the marginal cost of renting out the auditorium. The marginal cost equals the extra costs the college incurs by allowing the student group to use an otherwise vacant auditorium. In our example, the extra cost is $100 for additional electricity and janitorial services. It would be sensible for the college to rent the auditorium because the marginal benefit ($150 offered by the student group) exceeds the marginal cost ($100). In fact, the college should be willing to rent the facility for any amount greater than $100. If the students and the college split the difference between the $200 the students are willing to pay and the $100 marginal cost, they would agree on a price of $150, leaving both parties better off by $50.

Most colleges do not use this sort of logic. Instead, they use complex formulas to compute the perceived cost of renting out a facility. In most cases, the perceived cost includes some costs that the university bears even if it doesn’t rent out the facility for the day. In our example, the facility manager included $300 worth of construction costs and $50 worth of insurance, for a total cost of $450 instead of just $100. Because many colleges include costs that aren’t affected by the use of a facility, they overestimate the actual cost of renting out their facilities, missing opportunities to serve student groups and make some money at the same time.

Automobile Emissions Standards

We can use the marginal principle to analyze emissions standards for automobiles. The U.S. government specifies how much carbon monoxide a new car is allowed to emit per mile. The marginal question is: “Should the standard be stricter, with fewer units of carbon monoxide allowed?” On the benefit side, a stricter standard reduces health-care costs resulting from pollution. If the air is cleaner, people with respiratory ailments will make fewer visits to doctors and hospitals, have lower medication costs, and lose fewer work days. On the cost side, a stricter standard requires more expensive control equipment on cars and may also reduce fuel efficiency. Using the marginal principle, the government should make the emissions standard stricter as long as the marginal benefit (savings in health-care costs and work time lost) exceeds the marginal cost (the cost of additional equipment and extra fuel used).
**APPLICATION 3**

**THE MARGINAL BENEFIT AND MARGINAL COST OF SPEED**

APPLYING THE CONCEPTS #3: How do people think at the margin?

Consider the decision about how fast to drive on a highway. The marginal benefit of going one mile per hour faster is the travel time you’ll save. On the cost side, an increase in speed increases your chances of colliding with another car, and also increases the severity of injuries suffered in a collision. A rational person will pick the speed at which the marginal benefit of speed equals the marginal cost.

In the 1960s and 1970s, the federal government required automakers to include a number of safety features, including seat belts and collapsible steering columns. These new requirements had two puzzling effects. Although deaths from automobile collisions decreased, the reduction was much lower than expected. In addition, more bicyclists were hit by cars and injured or killed.

We can use the marginal principle to explain why seat belts and other safety features made bicycling more hazardous. The mandatory safety features decreased the marginal cost of speed. People who wear seat belts suffer less severe injuries in a collision, so every additional unit of speed is less costly. Drivers feel more secure because they were better insured from harm in the event of a collision, and so they drove faster. As a result, the number of collisions between cars and bicycles increased, meaning that safer environments for drivers led to a more hazardous environment for bicyclists. **Related to Exercises 2.4 and 2.5.**


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**2.3 THE PRINCIPLE OF VOLUNTARY EXCHANGE**

The principle of voluntary exchange is based on the notion that people act in their own self-interest. Self-interested people won’t exchange one thing for another unless the trade makes them better off.

**PRINCIPLE OF VOLUNTARY EXCHANGE**

A voluntary exchange between two people makes both people better off.

Here are some examples.

- If you voluntarily exchange money for a college education, you must expect you’ll be better off with a college education. The college voluntarily provides an education in exchange for your money, so the college must be better off, too.
- If you have a job, you voluntarily exchange your time for money, and your employer exchanges money for your labor services. Both you and your employer are better off as a result.

**Exchange and Markets**

Adam Smith stressed the importance of voluntary exchange as a distinctly human trait. He noticed:

> a propensity in human nature . . . to truck, barter, and exchange one thing for another . . . It is common to all men, and to be found in no other . . . animals . . . Nobody ever saw a dog make a fair and deliberate exchange of one bone for another with another dog.

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APPLICATION 4

TIGER WOODS AND WEEDS

APPLYING THE CONCEPTS #4: What is the rationale for specialization and exchange?

Should Tiger Woods whack his own weeds? The swinging skills that make Tiger Woods one of the world's best golfers also make him a skillful weed whacker. His large estate has a lot of weeds, and it would take the best gardener 20 hours to take care of all of them. With his powerful and precise swing, Tiger could whack down all the weeds in just one hour. Since Tiger is 20 times more productive than the best gardener, should he take care of his own weeds?

We can use the principle of voluntary exchange to explain why Tiger should hire the less productive gardener. Suppose Tiger earns $1,000 per hour playing golf—either playing in tournaments or giving lessons. For Tiger, the opportunity cost of weed whacking is $1,000—the income he sacrifices by spending an hour cutting weeds rather than playing golf. If the gardener charges $10 per hour, Tiger could hire him to take care of the weeds for only $200. By switching one hour of his time from weed whacking to golf, Tiger earns $1,000 and incurs a cost of only $200, so he is better off by $800. Tiger Woods specializes in what he does best, and then buys goods and services from other people. Related to Exercise 3.5.

As we saw in Chapter 1, a market is an institution or arrangement that enables people to exchange goods and services. If participation in a market is voluntary and people are well informed, both people in a transaction—buyer and seller—will be better off. The next time you see a market transaction, listen to what people say after money changes hands. If both people say “thank you,” that’s the principle of voluntary exchange in action. The double “thank you” reveals that both people are better off.

The alternative to exchange is self-sufficiency. Each of us could produce everything for himself or herself. As we’ll see in the next chapter, it is more sensible to specialize, doing what we do best and then buying products from other people, who in turn are doing what they do best. For example, if you are good with numbers but an awful carpenter, you could specialize in accounting and buy furniture from Woody, who could specialize in making furniture and pay someone to do his bookkeeping. In general, exchange allows us to take advantage of differences in people’s talents and skills.

Online Games and Market Exchange

As another illustration of the power of exchange, consider the virtual world of online games. Role-playing games such as World of Warcraft and EverQuest allow thousands of people to interact online, moving their characters through a landscape of survival challenges. Each player creates a character—called an avatar—by choosing some initial traits for it. The player then navigates the avatar through the game’s challenges, where it acquires skills and accumulates assets, including clothing, weapons, armor, and even magic spells.

The curious part about these role-playing games is that players use real-life auction sites, including eBay and Yahoo! Auctions, to buy products normally acquired in the game. Byron, who wants a piece of armor for his avatar (say, a Rubicite girdle), can use eBay to buy one for $50 from Selma. The two players then
enter the online game, and Selma's avatar transfers the armor to Byron's avatar. It is even possible to buy another player's avatar, with all its skills and assets. Given the time required to acquire various objects such as Rubicite girdles in the game and the prices paid for them on eBay, the implicit wage earned by the typical online player auctioning them off is $3.42 per hour. That's how much the player could earn by first taking the time to acquire the assets in the game and then selling them on eBay.

2.4 THE PRINCIPLE OF DIMINISHING RETURNS

Xena has a small copy shop, with one copying machine and one worker. When the backlog of orders piled up, she decided to hire a second worker, expecting that doubling the workforce would double the output of her copy shop from 500 pages per hour to 1,000. Xena was surprised when output increased to only 800 pages per hour. If she had known about the principle of diminishing returns, she would not have been surprised.

**PRINCIPLE OF DIMINISHING RETURNS**

Suppose output is produced with two or more inputs, and we increase one input while holding the other input or inputs fixed. Beyond some point—a called the point of diminishing returns—output will increase at a decreasing rate.

Xena added a worker (one input) while holding the number of copying machines (the other input) fixed. Because the two workers must share a single copying machine, each worker spent some time waiting for the machine to be available. As a result, adding the second worker increased the number of copies, but did not double the output. With a single worker and a single copy machine, Xena has already reached the point of diminishing returns. As she increases the number of workers, output increases, but at a decreasing rate. The first worker increases output by 500 pages (from 0 to 500), but the second worker increases output by only 300 pages (from 500 to 800).

**Diminishing Returns from Sharing a Production Facility**

This principle of diminishing returns is relevant when we try to produce more output in an existing production facility (a factory, store, office, or farm) by increasing the number of workers sharing the facility. When we add a worker to the facility, each worker becomes less productive because he or she works with a smaller piece of the facility. More workers share the same machinery, equipment, and factory space. As we add more and more workers into the factory, total output increases, but at a decreasing rate.

It is important to emphasize that diminishing returns occurs because one of the inputs to the production process is fixed. When a firm can vary all its inputs, including the size of the production facility, the principle of diminishing returns is not relevant. For example, if a firm doubled all its inputs, building a second factory and hiring a second workforce, we would expect the total output of the firm to at least double. The principle of diminishing returns does not apply when a firm is flexible in choosing all its inputs.
APPLICATION 5

FERTILIZER AND CROP YIELDS

APPLYING THE CONCEPTS #5: Do farmers experience diminishing returns?

The notion of diminishing returns applies to all inputs to the production process. For example, one of the inputs in the production of corn is nitrogen fertilizer. Suppose a farmer has a fixed amount of land (an acre) and must decide how much fertilizer to apply. The first 50-pound bag of fertilizer will increase the crop yield by a relatively large amount, but the second bag is likely to increase the yield by a smaller amount, and the third bag is likely to have an even smaller effect. Because the farmer is changing just one of the inputs, the output will increase, but at a decreasing rate. Eventually, additional fertilizer will actually decrease output as the other nutrients in the soil are overwhelmed by the fertilizer.

Table 2.1 shows the relationship between the amount of fertilizer and the corn output. The first 50-pound bag of fertilizer increases the crop yield from 85 to 120 bushels per acre, a gain of 35 bushels. The next bag of fertilizer increases the yield by only 15 bushels (from 120 to 135), followed by a gain of 9 bushels (from 135 to 144) and then a gain of only 3 bushels (from 144 to 147). The farmer experienced diminishing returns because the other inputs to the production process are fixed. Related to Exercises 4.5 and 4.6.

<table>
<thead>
<tr>
<th>Bags of Nitrogen Fertilizer</th>
<th>Bushels of Corn Per Acre</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>85</td>
</tr>
<tr>
<td>1</td>
<td>120</td>
</tr>
<tr>
<td>2</td>
<td>135</td>
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<td>3</td>
<td>144</td>
</tr>
<tr>
<td>4</td>
<td>147</td>
</tr>
</tbody>
</table>

2.5 THE REAL-NOMINAL PRINCIPLE

One of the key ideas in economics is that people are interested not just in the amount of money they have but also in how much their money will buy.

REAL-NOMINAL PRINCIPLE

What matters to people is the real value of money or income—its purchasing power—not its “face” value.

To illustrate this principle, suppose you work in your college bookstore to earn extra money for movies and snacks. If your take-home pay is $10 per hour, is this a high wage or a low wage? The answer depends on the prices of the goods you buy. If a movie costs $4 and a snack costs $1, with one hour of work you could afford to see two movies and buy two snacks. The wage may seem high enough for you. But if a movie costs $8 and a snack costs $2, an hour of work would buy only one movie and...
one snack, and the same $10 wage doesn't seem so high. This is the real-nominal principle in action. What matters is not how many dollars you earn, but what those dollars will purchase.

Economists use special terms to express the ideas behind the real-nominal principle:

- **The nominal value** of an amount of money is simply its face value. For example, the nominal wage paid by the bookstore is $10 per hour.
- **The real value** of an amount of money is measured in terms of the quantity of goods the money can buy. For example, the real value of your bookstore wage would fall as the prices of movies and snacks increase, even though your nominal wage stayed the same.

## APPLICATION

### THE DECLINING REAL MINIMUM WAGE

#### APPLYING THE CONCEPTS #6: How does inflation affect the real minimum wage?

Between 1974 and 2007, the federal minimum wage increased from $2.00 to $5.85. Was the typical minimum-wage worker better or worse off in 2007? We can apply the real-nominal principle to see what's happened over time to the real value of the federal minimum wage.

As shown in the first row of Table 2.2, the minimum wage was $2.00 per hour in 1974, and by 2007 it had risen to $5.85. These are nominal figures, indicating the face value of the minimum wage. By working 40 hours per week, a minimum-wage worker could earn $80 in 1974 and $234 in 2007. The third row of Table 2.2 shows the cost of a standard basket of consumer goods, which includes a standard mix of housing, food, clothing, and transportation. In 1974, consumer prices were relatively low, and the cost of buying all the goods in the standard basket was only $47. Between 1974 and 2007, consumer prices increased, and the cost of this standard basket of goods increased to $202.

The last row in Table 2.2 shows the purchasing power of the minimum wage in 1974 and 2007. In 1974, the $80 in weekly income could buy 1.70 standard baskets of goods. Between 1974 and 2007, the weekly income nearly tripled, but the cost of the standard basket of goods more than quadrupled, from $47 to $202. As a result, the weekly income of $234 in 2007 could buy only 1.16 baskets of goods. Because prices increased faster than the nominal wage, the real value of the minimum wage actually decreased over this period.

The minimum wage increased to $6.55 in July 2008 and $7.25 one year later. These wage hikes are not large enough to restore the 1974 purchasing power of the minimum wage. For that to happen, the minimum wage in July of 2008 would have to be about $8.84.

**Related to Exercises 5.4 and 5.6.**

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### Table 2.2: The Real Value of the Minimum Wage, 1974–2007

<table>
<thead>
<tr>
<th></th>
<th>1974</th>
<th>2007</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum wage per hour</td>
<td>$2.00</td>
<td>$5.85</td>
</tr>
<tr>
<td>Weekly Income from min.</td>
<td>80</td>
<td>234</td>
</tr>
<tr>
<td>Cost of standard basket</td>
<td>47</td>
<td>202</td>
</tr>
<tr>
<td>Number of baskets per week</td>
<td>1.70</td>
<td>1.16</td>
</tr>
</tbody>
</table>
The real-nominal principle can explain how people choose the amount of money to carry around with them. Suppose you typically withdraw $40 per week from an ATM to cover your normal expenses. If the prices of all the goods you purchase during the week double, you would have to withdraw $80 per week to make the same purchases. The amount of money people carry around depends on the prices of the goods and services they buy.

Government officials use the real-nominal principle when they design public programs. For example, Social Security payments are increased each year to ensure that the checks received by the elderly and other recipients will purchase the same amount of goods and services, even if prices have increased. The government also uses this principle when it publishes statistics about the economy. For example, it reports about changes in "real wages" in the economy over time taking into account the prices of the goods workers purchase. Therefore, the real wage is stated in terms of its buying power, rather than its face value or nominal value.

**APPLICATION 7**

REPAYING STUDENT LOANS

APPLYING THE CONCEPTS #7: How does inflation affect lenders and borrowers?

Suppose you finish college with $20,000 in student loans and start a job that pays a salary of $40,000 in the first year. In 10 years, you must repay your college loans. Which would you prefer, stable prices, rising prices, or falling prices?

We can use the real-nominal principle to compare the real cost of repaying your loan. The first row of Table 2.3 shows the cost of the loan when all prices in the economy are stable—including the price of labor, your salary. In this case, your nominal salary in 10 years is $40,000, and the real cost of repaying your loan is the half-year of work you must do to earn the $20,000 you owe. However, if all prices double over the 10-year period, your nominal salary will double to $80,000, and, as shown in the second row of Table 2.3, it will take you only a quarter of a year to earn $20,000 to repay the loan. In other words, a general increase in prices lowers the real cost of your loan. In contrast, if all prices decrease and your annual salary drops to $20,000, it will take you a full year to earn the money to repay the loan. In general, people who owe money prefer inflation (a general rise in prices) to deflation (a general drop in prices).

Related to Exercises 5.5 and 5.8.

| TABLE 2.3 EFFECT OF INFLATION AND DEFALATION ON LOAN REPAYMENT |
|-----------------|-----------------|--------------|
| Change In Prices and Wages | Annual Salary | Years of Work to Repay $20,000 Loan |
| Stable | $40,000 | 1/2 year |
| Inflation: Salary doubles | $80,000 | 1/4 year |
| Deflation: Salary cut in half | $20,000 | 1 year |
SUMMARY

This chapter covers five key principles of economics, the simple, self-evident truths that most people readily accept. If you understand these principles, you are ready to read the rest of the book, which will show you how to do your own economic analysis.

1 Principle of opportunity cost. The opportunity cost of something is what you sacrifice to get it.

2 Marginal principle. Increase the level of an activity as long as its marginal benefit exceeds its marginal cost. Choose the level at which the marginal benefit equals the marginal cost.

3 Principle of voluntary exchange. A voluntary exchange between two people makes both people better off.

4 Principle of diminishing returns. Suppose that output is produced with two or more inputs, and we increase one input while holding the other inputs fixed. Beyond some point—called the point of diminishing returns—output will increase at a decreasing rate.

5 Real-nominal principle. What matters to people is the real value of money or income—its purchasing power—not the face value of money or income.

KEY TERMS

- marginal benefit, p. 33
- nominal value, p. 41
- marginal cost, p. 33
- opportunity cost, p. 30
- production possibilities curve, p. 31
- real value, p. 41

EXERCISES

2.1 The Principle of Opportunity Cost

1.1 Consider Figure 2.1 on page 31. Between points $e$ and $d$, the opportunity cost of
4. tons of what is __________ tons of steel.

1.2 Arrow up or down: An increase in the wage for high-school graduates __________ the opportunity cost of college.

1.3 Arrow up or down: An increase in the market interest rate __________ the economic cost of holding a $500 collectible for a year.

1.4 You just inherited a house with a market value of $300,000, and do not expect the market value to change. Each year, you will pay $1,000 for utilities and $3,000 in taxes. You can earn 6 percent interest on money in a bank account. Your cost of living in the house for a year is __________.

1.5 What is the cost of a pair of warships purchased by Malaysia? (Related to Application 2 on page 34.)

1.6 Conservationists have a new strategy for preserving rainforests: __________ loggers and other developers for the land, paying as little as __________ per hectare per year.

1.7 The Cost of a Flower Business. Jen left a job paying $40,000 per year to start her own florist shop in a building she owns. The market value of the building is $200,000. She pays $30,000 per year for flowers and other supplies, and has a bank account that pays 8 percent interest. The annual economic cost of Jen’s business is __________. (Related to Application 1 on page 32.)

1.8 The Opportunity Cost of a Mission to Mars. The United States has plans to spend billions of dollars on a mission to Mars. List some of the possible opportunity costs of the mission. What resources will be used to execute the mission, and what do we sacrifice by using these resources in a mission to Mars? (Related to Application 2 on page 34.)