An Introduction to Microeconomics

Microeconomic theory helps us understand and predict
real-world outcomes.

Chapter Outline

Learning Objectives

- Convey the scope of microeconomic theory and explain why theory, in general, is essential to understanding and predicting real-world outcomes.
- Distinguish between positive and normative analysis.
- Differentiate between real and nominal prices.
- Introduce the concept of opportunity cost and explain how economic costs differ from accounting costs.
- Show how a production possibility frontier graphically depicts the basic assumptions economists make about market actors as well as the concept of opportunity cost.
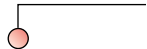
I f employers are required by the government to provide health care for their employees, who will bear the cost of the mandate? When quotas are placed on imports of Japanese cars, is the United States better off? Why is the World Wide Web often dubbed the World Wide Wait? Will issuing firms tradeable permits to pollute be an effective way to control smog in the Los Angeles basin? Will per-bag billing charges in trash collection encourage greater recycling? Does rate regulation lead to lower rates for cable television service? Why do dry cleaners charge more to launder women's blouses than men's shirts? And, should apparent monopolies such as Microsoft be praised for their efficiency and profitability or subject to antitrust prosecution and broken up?

As these questions suggest, there are many interesting issues that microeconomic theory can help us understand. This text presents the analytical techniques of microeconomics and shows how to apply them to explain or predict real-world phenomena.

This chapter introduces microeconomic theory by first discussing its nature and the role of theory in general. The remainder of the chapter covers the basic assumptions economists make about market participants and the key concept of opportunity cost.

1.1 THE SCOPE OF MICROECONOMIC THEORY

The prefix *micro-* in microeconomics comes from the Greek word *mikros*, meaning small. It contrasts with macroeconomics, the other branch of economic theory. **Macroeconomics** deals primarily with aggregates, such as the total amount of goods and services produced by society and the absolute level of prices, while **microeconomics** analyzes the behavior of "small" units: consumers, workers, savers, business managers, firms, individual industries and markets, and so on. Microeconomics, however, is not limited to "small" issues. Instead, it reflects the fact that many "big" issues can best be understood by recognizing that they are composed of numerous smaller parts. Just as much of our knowledge of chemistry and physics is built on the study of molecules, atoms, and subatomic particles, much of our knowledge of economics is based on the study of individual behavior.

MACROECONOMICS
the study of aggregate economic factors

MICROECONOMICS
the study of the behavior of small economic units such as consumers and firms

Individuals are the fundamental decisionmakers in any society. Their decisions, in the aggregate, define a society's economic environment. Consumers decide how much of various goods to purchase, workers decide what jobs to take, and business owners decide how many workers to hire and how much output to produce. Microeconomics encompasses the factors that influence these choices and the way these innumerable small decisions merge to determine the workings of the entire economy. Because prices have important effects on these individual decisions, microeconomics is frequently called **price theory**.

PRICE THEORY
another term for microeconomics

1.2 THE NATURE AND ROLE OF THEORY

In disciplines from physics to political science, using a theory to make sense of a complex reality is essential. Facts do not always "speak for themselves." In economics, facts may describe a historical episode, but facts can never explain why the episode occurred or how things would have been different had, for example, the government pursued another policy. Moreover, facts can never demonstrate how, for instance, a change in agricultural price supports will affect agricultural production next year. For purposes of explanation or prediction, we must employ a theory that shows how facts are related to one another.

Theory in economics, as in other sciences, is based on certain assumptions. For example, economists assume that firms strive to maximize profit. Based on this assumption, the economic theory of the firm explains what mix of steel and plastic firms such as Toyota and General Motors (GM) employ in production as well as what amount of cars and trucks they produce. The theory also explains how Toyota's and GM's desired input mixes and final output levels are affected by changes in, say, the price of steel or the price received per car sold.

Economic theory can be used to predict as well as to explain real-world outcomes. For instance, the basic supply–demand model (discussed in Chapter 2) can explain the effects observed in cities that have enacted rent control laws. It can also predict the effects should the federal government impose similar price ceilings on health care services.

How do we know if a theory, whether it be in economics, physics, or political science, is a "good" theory? Basically, *a theory is considered to be valid and useful if it successfully explains and predicts the phenomena that it is intended to explain and predict*. In keeping with this litmus test, theories are continually stacked up against real-world data. Depending on how well a theory matches the data, the theory is maintained, refined, or sometimes even discarded (perhaps in favor of a competing explanation). The continual process of testing theories against real-world data is critical to the advancement of any science, not just economics.

In testing a theory, it is important to note that imperfection tends to be the norm. That is, "good" theories typically do not explain the observed data perfectly nor are the assumptions upon which they are based entirely realistic. For example, consider the *calorie theory*, one accepted by millions of people. The calorie theory holds that a person's weight depends on the number of calories consumed per day: the more calories ingested, the heavier the person will be.

The calorie theory predicts that to lose weight, a person should cut his or her calorie intake. Is this a valid and useful theory? Consider two criticisms: First, the calorie theory is based on assumptions that are not completely realistic. That is, no one has ever seen a calorie, much less observed the human body convert it into weight. Second, the theory is not perfect. Reducing your calorie intake will not necessarily make you thin. Other factors, besides calories, influence a person's weight: heredity, exercise, metabolism, ratio of fat to protein consumption, and so on.

Does this mean that people who count calories are wrong? Not at all. In fact, the calorie theory is quite useful for millions of weight watchers around the world. For them, the general relationship between calories and weight tends to hold and becomes even stronger once the calorie theory is refined to account for other factors such as heredity, exercise, metabolism, and so forth.

Such is the case with economics. While firms may not appear to maximize profit (think about Amazon.com or Biogen), and refinements accounting for special features of particular markets may be necessary (long-run versus short-run profitability in industries where firms must make substantial up-front research and development investments), the economic theory of the firm based on the assumption of profit maximization successfully explains and predicts a wide range of real-world phenomena. Thus the theory is useful to both business managers and public policymakers.
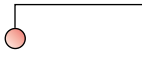
1.3　Positive Versus Normative Analysis

Economic theory is a tool for understanding relationships in the economy. While it can explain the behavior of market actors, it cannot determine which public policies are desirable and which are not. Economics can help us evaluate the results of public policies, but it never, by itself, demonstrates whether the results are good or bad.

Consider the federal minimum wage—first set in 1938 at $0.25 per hour and periodically increased over the years (to $5.15 per hour by 1997). Evaluating the desirability of this policy requires three steps. First, one must determine the qualitative effects of the policy. For example, how does it affect the employment of workers by firms? Does it increase or decrease employment? Second, one must determine the magnitude of the effects. If the minimum wage leads to less employment, how much less? How many workers lose their jobs and how many retain their jobs at the higher wage rate? Finally, a judgment needs to be made as to whether the policy's effects are desirable. Does the benefit to workers who remain employed outweigh the costs to those workers whose jobs are cut?

The first step involves identifying the qualitative nature of a policy's consequences. This step is in the realm of **positive analysis**, assessing the expected, objective outcomes. The distinguishing feature of positive analysis is that it deals with propositions that can be tested with respect to both their underlying logic and the empirical evidence. It deals with what is, or what might be, without deciding whether something is right or wrong, good or bad. Positive analysis is scientific because it draws on accepted rules of logic and evidence, of both a qualitative and quantitative nature, that can be used to determine the truth or falsity of statements. Microeconomic theory is a form of positive analysis; it can be used, for example, to make the qualitative prediction that a minimum wage law will reduce employment.

POSITIVE ANALYSIS
assessment of expected objective outcomes

If we want to resolve the question of desirability, however, identifying the qualitative nature of the effects is not sufficient. We also need some idea of the size of the effects. It may matter a great deal whether the minimum wage causes 1 percent or 25 percent of unskilled workers to lose their jobs. Note that this step still involves positive analysis, but in quantitative rather than qualitative terms.

Knowing the consequences, both qualitative and quantitative, is still not sufficient to determine whether a policy is desirable. A final step is necessary: we must decide whether the consequences themselves are, on balance, desirable. To make this evaluation, each person must make a **normative analysis**, or value judgment. By nature, such a judgment is nonscientific. It cannot be proved right or wrong by facts, evidence, or logic. It stems from the value system of the person making the judgment. For example, a belief that it is desirable to raise the wages of the lowest-paid workers, even at the expense of others, falls into this category. People may agree that a particular policy has this effect, but some may hold that the outcome is desirable and others that it is not. Their value judgments differ.

Microeconomic theory cannot demonstrate that a particular set of economic institutions or policies is desirable—and neither, for that matter, can any other scientific branch of knowledge. A belief that something is desirable requires a nonscientific judgment of what constitutes *desirability*, and that value judgment is the domain of normative analysis. Nonetheless, microeconomic theory can assist each of us in reaching such normative judgments by helping us determine the likely outcomes. In other words, microeconomics helps us take the first two of the three steps necessary to evaluate real-world phenomena.

NORMATIVE ANALYSIS
a nonscientific value judgment

1.4   MARKET ANALYSIS AND REAL VERSUS NOMINAL PRICES

Most of microeconomics involves the study of how individual markets function. **Markets** involve the interplay of all potential buyers and sellers of a particular commodity or service. Most economic issues concern the way particular markets function. For example, an economist's wages are likely to be higher than those of a gas station attendant but lower than those of a doctor. This situation reflects the workings of the three labor markets.

To analyze markets, we concentrate on factors having the greatest influence on the decisions of buyers and sellers. Prices receive special attention. Prices result from market transactions, but they also strongly influence the behavior of buyers and sellers in every market.

In microeconomics, the term *price* always refers to the relative or real price of an item. The **nominal price**, or *absolute price*, by itself does not tell us how costly an item really is. Is a 10-cent cup of coffee expensive? In 1900 it would have been outrageously expensive; today it would be a bargain. The problem with nominal prices is that a dollar is an elastic yardstick. *The* **real price** *of a good reflects its nominal price adjusted for the changing value of money*. Table 1.1 clarifies the distinction between real and nominal prices. Between 1983 and 2002, the price level, or average price of goods and services, rose by 80 percent according to the Consumer Price Index (CPI). [The CPI for all items in 2002 was 180; it was 100 in the base year, 1983, so it rose by $(180 - 100)/100$, or 80 percent.] The CPI measures the change in nominal prices. Table 1.1 indicates that the nominal prices of some goods, such as college tuition, rose by much more than the average 80 percent, and the prices of others, like gasoline, rose less.

The last column in Table 1.1 lists the change in each item's price compared with the change in the average of all prices. Although the *nominal price* of cereal rose by 104 percent, the overall price level rose by 80 percent over the same period, so the *real price* of cereal rose by only 13 percent $[(204 - 180)/180]$. No matter how the nominal price changed between 1983 and 2002, an economist would say that the prices of the first four individual items rose

MARKETS
the interplay of all potential buyers and sellers of a particular commodity or service

NOMINAL PRICE
the absolute price, not adjusted for the changing value of money

REAL PRICE
the nominal price adjusted for the changing value of money

TABLE 1.1

NOMINAL AND REAL PRICE CHANGES, 1983 TO 2002

	Index of Nominal Prices in 2002 (1983 = 100)	Change in Real Prices, 1983 to 2002
All items	180	—
College tuition	363	+102%
Medical care	283	+57%
Cereal	204	+13%
Residential rent	198	+10%
Beer and ale	165	−8%
Women's shoes	122	−32%
Gasoline	121	−33%
Interstate telephone calls	62	−66%

Source: U.S. Department of Labor, *CPI Detailed Report*, April 2002.

while the prices of the last four fell. The term *price* always refers to a real price. The prices we use in discussion and in various diagrams refer to real prices, unless otherwise noted. But these prices are generally measured in dollar units. This practice is legitimate as long as we are using dollars of *constant purchasing power*—which is the same as measuring each price in comparison with the general price level.

APPLICATION 1.1

THE OLD RICH VERSUS THE NEW RICH: A REAL COMPARISON

John D. Rockefeller, the early-twentieth-century oil tycoon, was worth $1.1 billion in nominal dollars in 1910. By contrast, in mid-2002, fifty-one Americans were multibillionaires according to a *Forbes* survey. Does this mean that Rockefeller was a financial lightweight relative to today's business executives? Hardly. Rockefeller's nominal wealth of 1910 is the equivalent of $22 billion in today's dollars, an amount surpassed by only four of America's "New Rich": Microsoft co-founders Bill Gates and Paul Allen (worth $53 billion and $25 billion as of mid-2002, respectively), Warren Buffett, chairman of Berkshire Hathaway ($35 billion), and Oracle's founder Larry Ellison ($24 billion).

1.5

BASIC ASSUMPTIONS ABOUT MARKET PARTICIPANTS

GOAL-ORIENTED BEHAVIOR
the behavior of market participants interested in fulfilling their own, personal goals

Economists make three basic assumptions about buyers and sellers. First, market participants are presumed to be **goal-oriented**—that is, interested in fulfilling their own, personal goals. For example, the Emir of Kuwait may desire an opulent personal jet and advanced medical care for his country's people. Basketball star Michael Jordan might long for greater privacy and the opportunity to play more golf. The late film star Marilyn Monroe hoped for ever greater success on the screen and stage, an Academy Award, and children of her own.

The assumption of goal-oriented behavior often is taken to indicate that individuals are self-interested. This assumption, however, does not imply that market participants care solely about their own pocketbooks. As economists use this term, the behavior of Mother

Teresa could accurately be described as goal-oriented. Although Mother Teresa's actions clearly indicated that she had little interest in worldly possessions, they did reflect her own personal desire to help the poor of Calcutta. The assumption of goal-oriented behavior does not rule out altruistic goals.

The second assumption economists make about market participants is that they engage in **rational behavior**. For example, we presume that Toyota's decision to build a factory in the United States is the outcome of a careful, deliberative process that weighs the expected benefits and costs. We presume an individual buys a new home based on knowledge of its market value and an honest appraisal of what he or she can afford.

The third, and most important, assumption made by economists about market participants is that they confront **scarce resources**. For example, there is simply not enough time, money, or other resources for the typical consumer to satisfy all of his or her desires. Human beings have relatively limitless desires, and no matter how wealthy they become, resources will never be plentiful enough to ensure that all their desires can be fulfilled.

If individuals rationally pursue their goals but have limited resources, choices must be made. Specifically, one must decide which goal to pursue and how far to pursue it. Microeconomics explores this process of making choices subject to resource constraints.

RATIONAL BEHAVIOR
the behavior of market participants based on a careful, deliberative process that weighs expected benefits and costs

SCARCE RESOURCES
insufficient time, money, or other resources for individuals to satisfy all their desires

1.6   OPPORTUNITY COST

Whenever you pursue one goal, you limit the extent to which your other goals can be satisfied with your scarce resources. For example, suppose that after getting your bachelor's degree and working for a few years, you enroll in a full-time, two-year MBA program. What would the cost of this choice be? You would incur some **explicit costs**, such as tuition, books, and parking. The dollars spent on such items could have been devoted to the pursuit of other goals. You would also face **implicit costs** associated with your own use of time. For example, instead of going to business school, you could have continued working and making $40,000 per year. The $40,000 in annual forgone wages would be an implicit cost associated with pursuing an MBA. In other words, the time and effort devoted to pursuing the MBA could have instead been used to generate $40,000 in each of the two years that you attend graduate business school.

To understand why implicit costs matter, assume that, relative to the option of remaining at work, the MBA entails explicit costs (such as tuition) of $50,000 and will increase your post-graduate lifetime earnings by $60,000. In this case you likely would not leave your job to pursue the MBA. The $60,000 increase in post-graduate earnings would be outweighed by the combined $50,000 in explicit costs and $80,000 in implicit costs of two years' lost wages.

The concepts of explicit and implicit costs also apply to the production side of a market. For firms making production decisions, explicit costs are those that are usually counted as costs in conventional accounting statements. They include payroll, raw materials, insurance, electricity, interest on debt, and so on. Implicit costs reflect the fact that a firm's resources can be allocated to other uses—AOL-Time-Warner, for example, can reallocate its resources from magazine publishing to the production of interactive video products.

The sum of the explicit and implicit costs associated with using some resource in a particular way is defined to be the resource's **economic cost** or **opportunity cost**. The concept of opportunity cost forces us to recognize that costs are not just money payments but also sacrificed alternatives. Where more than two uses for a resource exist and the resource can be de-

EXPLICIT COSTS
money used in the pursuit of a goal that could otherwise have been spent on an alternative objective

IMPLICIT COSTS
costs associated with the individual's use of his or her own time

ECONOMIC COST OR OPPORTUNITY COST
the sum of explicit and implicit costs

voted to only one use at a time, the opportunity cost of using the resource in a particular way is the value of the resource in its best alternative use. So, if your options are business school, continuing to work in your current job for $40,000 per year, and switching to a similarly demanding job that only pays $30,000 per year, you would take into account only the implicit cost of giving up your current job in determining the opportunity cost of pursuing the MBA.

APPLICATION 1.2 — THE RISE OF MAIL-ORDER AND ONLINE SHOPPING

By any absolute or relative measure mail-order and online shopping has increased dramatically over the past few decades. An important reason for this development involves a change in the implicit cost of shoppers' time. With the growth of two-wage-earner families and the greater work commitments faced by such families, the implicit cost of shoppers' time has increased significantly. By comparison, earlier in the twentieth century, one-wage-earner families were more common and the "nonworking" spouse typically specialized in taking care of the family's household needs, including shopping. As the implicit cost of time spent on shopping has increased, families have economized on the amount of time devoted to shopping through devices such as mail-order catalogs and the Internet. The increase in the implicit cost of shoppers' time also helps explain the growth of fast-food restaurants, convenience stores being bundled together with gasoline stations, and one-stop shopping hypermarkets such as Sam's Club.

Of course, as households have shifted to buying everything from clothing and furniture to food and books through mail-order and Web sites, mailboxes have had to adjust. For example, one of the author's mailboxes has collapsed twice from the sheer weight and wear and tear associated with the mail-order catalogs. It had to be replaced by an ultra-durable, supersized version. Moreover, some households are soon expected to have "home delivery portals" the size of hotel guest-room refrigerators, costing about $300 apiece to produce, and much more agreeable to customers who cannot be there or want things delivered while they are asleep. Such computerized mailboxes will be able to remember who delivered what and when and will be connected to security systems to deter thieves (perhaps even hidden underground to pop up only on a delivery driver's signal). They will have several components: some refrigerated to protect perishables; others heated to keep croissants and cappucino at serving temperatures.

APPLICATION 1.3 — THE COST OF GROWING GRIDLOCK

According to the Texas Transportation Institute's annual report on traffic congestion in 68 urban areas, the average person spends three times as much time sitting in traffic as he or she did 20 years ago (36 hours now versus 11 hours in 1982). The opportunity costs associated with the growing gridlock are substantial: $78 billion a year in burned gasoline (explicit costs) and wasted time (implicit costs). These costs are highest in Los Angeles ($1,000 per person annually in wasted gas and time) where the average person spends 56 more hours a year on freeways than would be necessary if traffic moved freely.

Economic Versus Accounting Costs

ACCOUNTING COSTS
costs reported in companies' net income statements generated by accountants

Because opportunity costs are not always readily apparent (especially their implicit components), they often are not accurately reflected in companies' net income statements. For example, consider a family-run grocery store in downtown Tokyo whose owners acquired the property several generations ago for almost nothing. From an accounting perspective, the grocery store may appear to be generating positive net income: revenue exceeds the sum of **accounting costs** comprising payroll, electricity, insurance, wholesale grocery costs, and so on. Still, the grocery store may be losing money from an economic perspective once the opportunity cost of the land on which it sits is taken into account. That is, the land could be sold or rented to someone else. This choice will generate payments that are sacrificed when the family uses the land to run a grocery. These forgone earnings represent an opportunity cost—and this cost can be significant. For example, the value of just the Imperial Palace grounds situated in the heart of Tokyo has been estimated to exceed the total value of real estate in the state of California.

APPLICATION 1.4   **WHY IT WAS PROFITABLE TO DEMOLISH A PROFITABLE HONG KONG HOTEL**

In June 1995, the 26-story Hong Kong Hilton, the first five-star hotel in the central business district of Hong Kong, was smashed to rubble. The hotel was demolished despite the facts that accounting statements showed $25 million in profit being earned on $58 million in revenue in 1994; $16 million had recently been spent to rebuild the hotel's lobby—more than the hotel cost to build in 1963; and the owner of the hotel had to pay $125 million to Hilton's parent company to break the last 20 years of the hotel's management contract. Why did the demolition make sense? With the astronomically high rental prices for office space in Hong Kong, property consultants estimated that an extra $70 million in rental income per year could be earned by constructing an office tower on the site historically occupied by the hotel.

Sunk Costs

SUNK COSTS
costs that have already been incurred and are beyond recovery

Although opportunity costs may not be readily apparent, they should always be taken into account when making economic decisions. The opposite is the case for **sunk costs**—costs that have already been incurred and are beyond recovery. Even though sunk costs are usually quite apparent, they need to be ignored when making economic decisions.

Consider the case of the Los Angeles Lakers, who negotiated a seven-year, $120 million contract with center Shaquille O'Neal in 2002. The contract involves a signing bonus of $22 million, plus annual payments averaging $14 million, should the Lakers exercise their option of playing O'Neal. But, suppose that after the contract is signed, a center comparable in talent to O'Neal offers his services to the Lakers for $105 million for the next seven years—annual payments of $15 million. What should the Lakers management do? The answer is, stick with O'Neal. Once the $22 million signing bonus has been paid to O'Neal, it is a sunk cost. The opportunity cost of exercising the O'Neal option is thus $98 million (the remaining amount that must be paid to O'Neal) versus the $105 million it would cost to hire the rival center.

APPLICATION 1.5   MEASURING ECONOMIC COSTS AND BENEFITS

Although important, measuring the economic costs and benefits associated with using resources in a particular way is not always easy. Take the case of intangibles that have no established market price, such as clean air, virgin wilderness, and endangered species. For example, how can we put a dollar value on the amount of damage (crude-oil-covered beaches, dead sea life, and so on) caused by Exxon's *Valdez* oil spill? Measuring intangibles is easiest when environmental problems cause direct harm to users: the value of lost recreational opportunities (such as less fishing, swimming, and hiking) can be estimated. It is more difficult when consumers have no contact with a natural resource but still place a positive value on its existence. For example, you may get a real "existence" value from knowing that sea otters or bald eagles exist, even though you may never actually see one. Of course, the benefit is likely to vary, depending on how strong an environmentalist you are.

When resources have no established market price, economists rely on a variety of methods to account for the economic costs and benefits associated with using the resources in a particular way. For example, techniques drawn from psychology and market research are employed to determine how much people who don't come into contact with a resource (such as a bald eagle) would be willing to pay to keep the resource in existence. The statistical tool of regression analysis (covered in Chapter 4) is utilized in other cases, such as determining the cost, in terms of noise pollution, of being located in an airport's flight path. Specifically, economists examine housing prices while holding constant all other factors (such as square footage, quality of area schools, and proximity to shopping centers). Any remaining difference between the price of homes that sit in airport flight paths and those that don't is assumed to reflect the cost of airport noise pollution.

1.7   PRODUCTION POSSIBILITY FRONTIER

PRODUCTION POSSIBILITY FRONTIER (PPF)
a depiction of all the different combinations of goods that a rational actor with certain personal goals can attain with a fixed amount of resources

We can display in graphical form the basic economic assumptions about market actors as well as the concept of opportunity cost. Specifically, a **production possibility frontier (PPF)** depicts all the different combinations of goods that a rational actor with certain personal goals can attain with a fixed amount of resources. For example, suppose you are president of a university. By effectively employing the resources on your campus, such as the faculty and staff, classrooms, libraries, laboratories, dorms, cyclotron, and so on, you can produce two possible services: research and teaching.

Based on the resources at your disposal, assume that the different combinations of research and teaching that your university can produce each year are represented by the *PPF* depicted in Figure 1.1. At one extreme, if your university were devoted solely to research, you could produce 1,000 units of research and 0 units of teaching (point A) with your limited resources. At the other extreme, if classroom instruction were the overriding objective, your university could produce a maximum of 500 units of teaching and 0 units of research (point Z). Of course, you need not be at either of the two extremes on your *PPF*. You also have the option of producing a mix of 500 units of research and 250 teaching units (point E) or, for that matter, any point lying on or inside (such as Y) the straight-line segment that we have drawn connecting endpoints A and Z of the *PPF* shown in Figure 1.1.

How does a *PPF* such as the one shown in Figure 1.1 reflect the three basic assumptions that we have made about market actors? Your desire as university president to encourage both research and teaching, if unlimited, would imply that you would like to be as far to the

FIGURE 1.1

A Production Possibility Frontier (*PPF*)
A *PPF* depicts the three basic assumptions made by economists about market participants (goal-oriented behavior, scarce resources, and rationality) as well as the concept of opportunity cost. With a nonsatiable desire for both research (R) and teaching (T), a university president would prefer to be as far to the northeast as possible on the graph. Scarce resources limit the president to any combination on or below the *PPF* boundary *AZ*. Rational behavior implies that the president will choose to be on the boundary as opposed to below it. Opportunity cost is reflected by the slope of the *PPF*.
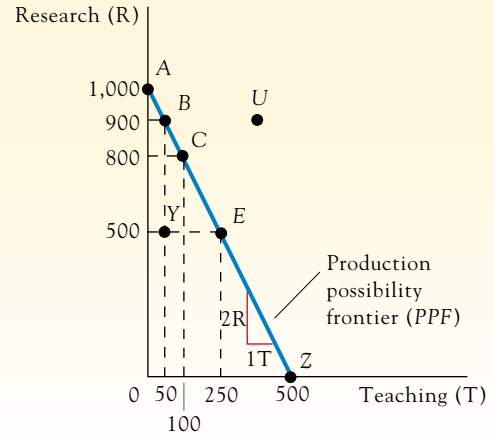
northeast as possible in the graph—generating an infinite amount of both research and teaching. But scarce resources, represented by the boundary, segment *AZ*, of your *PPF*, keep you inside the *PPF*. Points such as *U*, beyond your *PPF*'s boundary, thus are unattainable. Finally, rational behavior presumes that you will choose a point on the *PPF* boundary rather than inside the boundary. Why choose a mix of output involving 500 research and 50 teaching units (point *Y*), when the same resources at your disposal can get you more of both research and teaching (such as at point *C*)? Rational behavior implies that you will select a point on the boundary (segment *AZ*) of your *PPF*.

Although the three basic economic assumptions about market actors imply that you will be on the boundary of your *PPF*, you must still choose a specific combination of research and teaching on the boundary. The three basic assumptions (positive analysis) can place you only on the *PPF* boundary. Once on the boundary, a value judgment (normative analysis) is necessary to determine the "best" point for you along the boundary. For example, if you believe that a good university should focus solely on research, you will probably opt for point *A* on the *PPF* boundary. If, instead, you believe that a university is distinguished exclusively by the quality of its classroom instruction, point *Z* is likely to be your selection.

Figure 1.1 also depicts the concept of opportunity cost. Consider the movement between points *A* and *B* on the boundary of the *PPF*. If you start off at point *A* with 0 teaching units and move to point *B* with 50 teaching units, 100 research units will have to be given up (from 1,000 research units at *A* to 900 at *B*). Thus, if the three basic economic assumptions about market participants hold and you are forced to move along the *PPF* boundary, you confront a tradeoff of 100 research units lost per 50 teaching units gained between points *A* and *B*. This tradeoff is the opportunity cost of using your resources to increase the number of teaching units from 0 to 50. By expanding output of teaching from 0 to 50, you are implicitly giving up 100 units of research. The opportunity cost of each additional teaching unit gained between 0 and 50 teaching units is 2 research units. And, since the boundary of the *PPF* as we have drawn it is a straight line, this per-teaching-unit opportunity cost is constant over the entire *AZ* boundary of the depicted *PPF*.

Constant per-unit opportunity costs occur only if the *PPF* boundary is a straight line. But the more typical *PPF* has a concave-shaped boundary bowed out from the origin, as in Figure 1.2. With a concave-shaped *PPF*, the slope of the boundary *AZ* becomes steeper (that is, more negative) as one moves from point *A*, where the university is producing just research and no teaching, to point *Z*, where the reverse is true. The per-unit opportunity cost of pro-

The Typical-Case *PPF*: Concave to the Origin
With a concave *PPF*, the per-unit opportunity cost of an additional unit of teaching increases with the more teaching one produces. A one-teaching-unit increase between points *A* and *B* along the boundary of the *PPF* is associated with an opportunity cost equal to 1 research unit. A one-teaching-unit increase between points *Y* and *Z* carries with it an opportunity cost of 100 research units.
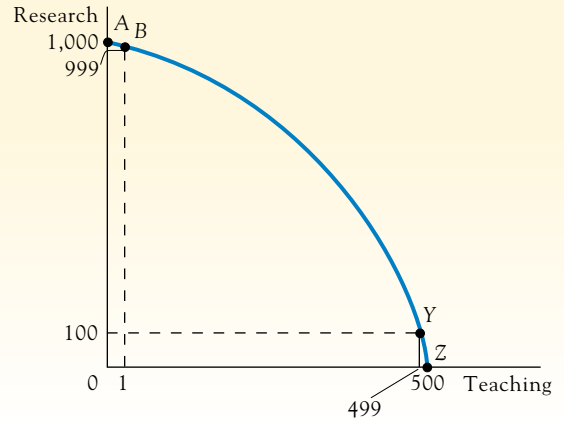
ducing additional teaching units, in terms of the research that must be given up, grows with the total output of teaching. For example, if you are producing 0 teaching units and want to expand output to 1 teaching unit, moving from point A to B in Figure 1.2, you would have to drop 1 research unit. The first teaching unit produced would have an opportunity cost of 1 research unit. When you are producing 499 teaching units, however, and want to expand teaching output by the same additional unit, the opportunity cost in terms of research that must be given up is much higher—100 research units must be given up to move from point Y to Z.

Why does the per-unit opportunity cost associated with expanding the output of any particular commodity typically increase in this way? The reason stems from differences in relative productivity across resources as related to various commodities. For example, some faculty are relatively better researchers, others do better in the classroom. When a university is at point A, the per-unit opportunity cost of increasing teaching output is fairly low. There are bound to be some faculty who are not prolific researchers, but who are adept at teaching. Reallocating such faculty to increase teaching output will not involve much of a per-unit loss in terms of research (one research unit between points A and B). By contrast, when one is already producing 499 units of teaching and contemplating increasing production to 500 (that is, moving from point Y to point Z), one has to move the most talented researchers full-time into the classroom, a far more costly undertaking in terms of forgone research.

SUMMARY

- Microeconomics is the branch of economics that studies the behavior of individual economic units such as consumers and business firms.
- Microeconomics considers how the decisions of individuals and firms are coordinated through interactions in markets.
- Economists assume that market participants are goal-oriented, rational, and constrained by scarce resources.

- Because of scarce resources, market participants can't fulfill their desires to the extent they would like, and choices must be made.
- Whenever one alternative is chosen, an opportunity cost is involved.
- A production possibility frontier (*PPF*) allows us to graphically depict the basic economic assumptions about market participants, as well as the concept of opportunity cost.

REVIEW QUESTIONS AND PROBLEMS

Questions and problems marked with an asterisk have solutions given in Answers to Selected Problems at the back of the book (page xxx).

1.1. In 1997, the citizens of Tucson, Arizona, voted on whether the minimum wage within the city should be raised to $7 per hour. Explain how one would use positive and normative analysis to evaluate the desirability of this proposed policy.

1.2. What economic forces might explain why the relative price of interstate telephone calls fell while the relative price of medical care increased between 1983 and 2002?

1.3. Explain why it is important to look at a good's real price as opposed to its nominal, or absolute, price.

1.4. Suppose that Meg Whitman, the successful head of eBay, who is paid an annual salary of $10 million, were to leave eBay and start her own management consulting company. If, in the new venture, Whitman chose not to pay herself a salary, the net income statement for her venture would not report an accounting cost associated with such a decision. Would there be an economic cost—an opportunity cost—associated with Whitman's new position in the management consulting firm?

*1.5. The RAND (short for "research and development") Corporation is a think tank located on 15 prime acres of seaside property in the center of Santa Monica, California. RAND purchased the land for its offices from the city in 1952 for $250,000. "Given that the money RAND paid for its land in 1952 can be treated as a sunk cost, the cost of the land to RAND is zero and RAND would thus be foolish to consider purchasing a new site in Las Vegas and relocating there." Is this statement true, false, or uncertain? Explain.

1.6. Tokyo's streets are characterized by a plethora of vending machines—dispensing everything from soft drinks, candy bars, and cigarettes to magazines, personal toiletries, and beer. Unlike other major cities such as New York and London, virtually every downtown street corner seems to have at least one vending machine. Relying on the concept of opportunity cost, explain why vending machines are so prevalent in Tokyo versus more traditional purveying mechanisms such as newsstands and grocery stores.

1.7. Reconsider the example in the text of whether you should pursue an MBA. Suppose that prior to making a decision you are robbed of $5,000. Should this theft affect your decision? How will the theft affect the accounting and economic costs associated with pursuing the MBA?

1.8. Instead of being robbed of $5,000, suppose that you win $50 in the state lottery prior to making your decision about whether to pursue an MBA. Should this windfall affect your decision?

1.9. Some people have argued that the United States cannot afford a volunteer army in which wages are high enough to attract competent enlistees. Instead, they suggest paying lower wages and drafting the required number of recruits. Would such a policy change lower the accounting and economic costs to the government for maintaining an army? Explain.

1.10. Say that the city of Los Angeles grants, for a price of $0, a sizable tract of land to Hughes Aircraft Company. The grant does not restrict Hughes to using the land only to produce military aircraft. Explain what the economic cost is to Hughes of using the granted land to produce military aircraft.

1.11. A university produces two commodities: research and teaching. The resources the university uses include faculty and staff, libraries, classrooms, and so on. The following schedule indicates some points on the university's *PPF*:

	A	B	C	D	E	F	G
Research	900	750	600	450	300	150	0
Teaching	0	20	45	75	110	150	200

a. Does research production by the university exhibit increasing, constant, or decreasing per-unit opportunity costs?

b. Graph the university's *PPF* (assuming that straight-line segments connect the points specified above). Indicate which areas of the graph correspond to unattainable production points, production points that make the most effective use of the university's resources, and points where there are unemployed resources.

c. Suppose that the university is at point *B* but would like to alter production to point *C*. What would be the per-teaching-unit opportunity cost of producing the extra teaching units?

d. Suppose that the university is at point *C* but would like to alter production to point *B*. What would be the per-research-unit opportunity cost of producing the extra research?

e. What will happen to the university's *PPF* if the main laboratory burns down (assume that the laboratory is not used to produce teaching but is used solely to produce research)? Graph the new *PPF*.

f. What will happen to the *PPF* if all of the campus resources are cut in half? Graph the new *PPF*.

g. Suppose the university is at point *F*. The university president proposes to move the school to point *B*; she claims that *B* is a more desirable choice since the total output is 750 + 20 = 770 total units of output at *B* versus 150 + 150 = 300 output units at *C*. Is the president correct?

1.12. Preparation time for the typical family meal has dwindled from two and a half hours in the early 1960s to 15 minutes today. Over the same time period, brown-bag lunches for school kids have yielded to prefabricated "meal kits." For example, Oscar Mayer launched its packaged Lunchables in 1988 and by 2002 was making over $700 million in meal-kit profits. Using the concept of opportunity cost, explain these phenomena.

1.13. "Motorola and other backers sank more than $5 billion in the 1990s into the development of Iridium, a satellite communications system to connect wireless telephone users anywhere on earth. Although the number of subscribers signing up for the service has fallen significantly below projections and operating costs vastly exceed revenues, this is no reason for Motorola and its partners to back out of the venture. Indeed, it would be foolish to quit now, given the large amount of money that has already been invested in Iridium." True, false, or uncertain? Explain.

1.14. Abraham Lincoln was paid $25,000 as president. Today, the president earns $400,000 a year. Does this mean that President Lincoln was relatively underpaid for his service? (*Hint:* The CPI in 1863 was 9.)

1.15. A study by Professor Gerald Scully of the University of Texas finds that government-sponsored killing of its own people—an act that claimed the lives of 170 million people in the twentieth century (7.3 percent of the total population and four times as many individuals as claimed by international and civil wars combined)—is less likely to occur the more productive is a country's populace (as measured by real gross domestic product per capita). Explain why this is consistent with the concept of opportunity cost.

1.16. How should the estimated opportunity costs associated with growing traffic gridlock (Application 1.3) be adjusted if the study has not accounted for the fact that motorists can make cellular phone calls while traveling on freeways? Explain.

1.17. In 1995, a former Brigham Young University football star, Eli Herring, turned down a three-year, $500,000-per-year offer to play professional football with the Oakland Raiders. Herring instead chose to pursue a career as a high school math teacher, earning $22,000 per year. Herring did so because he is a devout Mormon who believes that the Sabbath should be observed. Accepting the Raider's offer, which involved playing games on Sunday, would have violated his belief that the Bible prohibits working on a day that should be devoted to going to church and spending time with family. From an economic perspective, did Herring make a rational choice by not signing with the Raiders? Explain.

1.18. Several times over the past two years the New York Stock Exchange's Dow Jones Industrial Index has fallen by over 300 points. Because such large point drops were virtually unheard of 20 years ago, investors would be foolish to consider investing in stocks. True, false, or uncertain? Explain.