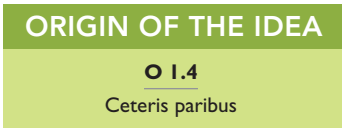
PART ONE

Introduction to Economics and the Economy

To the Student

This book and its ancillaries contain several features designed to help you learn economics:

- ***Web buttons (indicators)*** A glance through the book reveals many pages with rectangular icons in the margins. These "buttons" alert you to helpful learning aids available with the book. The blue green button denotes "Interactive Graphs" found at the text's Web site, **www.mcconnell18e.com**. Brief exercises have you interact with the graphs, for example, by clicking on a specific curve and dragging it to a new location. These exercises will enhance your understanding of the underlying concepts. The blue button symbolizes "Worked Problems." Numeric problems are presented and then solved, side-by-side, step-by-step. Seeing how the problems are worked will help you solve similar problems on quizzes and exams. The green button stands for "Origin of the Idea." Each of these pieces traces a particular idea to the person or persons who first developed it.



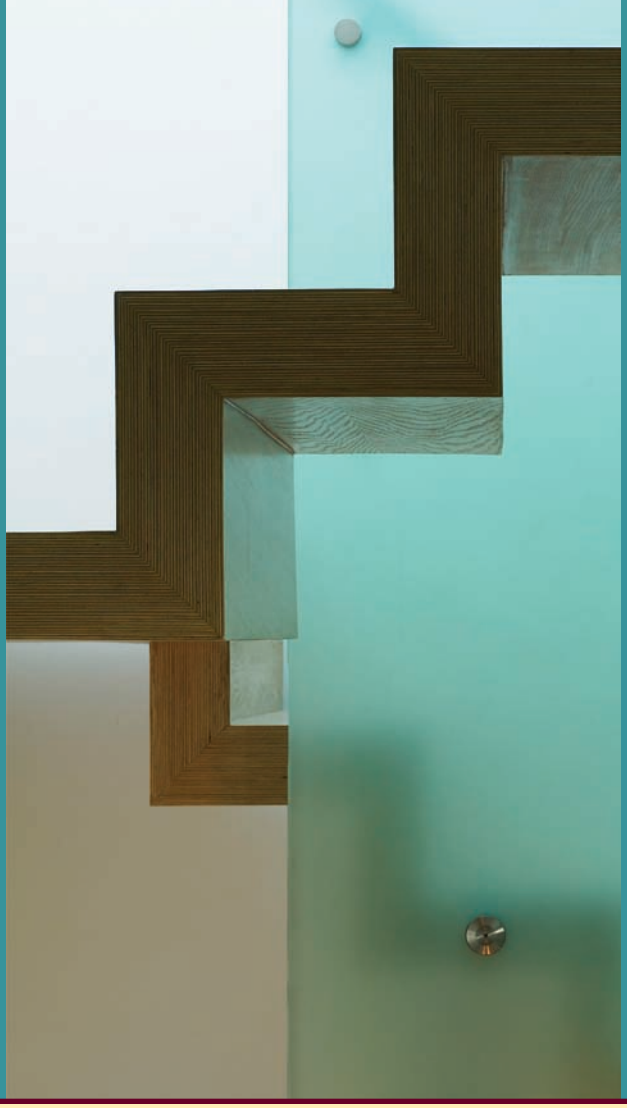
  After reading a chapter, thumb back through it to note the Web buttons and their associated numbers. On the home page of our Internet site select Student Edition and use the pull-down list under "Choose one" to find the Web button content for each chapter.
- ***Other Internet aids*** Our Internet site contains many other aids. In the Student Edition you will find self-testing multiple-choice quizzes, PowerPoint presentations, and much more. For those of you with a very strong mathematics background, be sure to note the "See the Math" section on the Web site. There you will find nearly 50 notes that develop the algebra and, in a few cases, the calculus that underlie the economic concepts.
- ***Appendix on graphs*** Be assured, however, that you will need only basic math skills to do well in the principles course. In particular, you will need to be comfortable with basic graphical analysis and a few quantitative concepts. The appendix at the end of Chapter 1 reviews graphs and slopes of curves. You may want to read it before starting Chapter 1.
- ***Reviews*** Each chapter contains two to four Quick Reviews and an end-of-chapter summary. These reviews will help you focus on essential ideas and study for exams.
- ***Key terms and Key Graphs*** Key terms are set in boldface type within the chapters, listed at the end of each chapter, and again defined in the glossary at the end of the book. Graphs with special relevance are labeled Key Graphs, and each includes a multiple-choice Quick Quiz. Your instructor may or may not emphasize all of these figures, but you should pay special attention to those that are discussed in class; you can be certain there will be exam questions on them.
- ***Consider This and Last Word boxes*** Many chapters include a Consider This box. These brief pieces provide commonplace analogies, examples, and stories that help you understand and remember central economic ideas. Each chapter concludes with a Last Word box. Some of them are revealing applications of economic ideas; others are short case studies. While it is tempting to ignore in-text boxes, don't. Most are fun to read, and all will improve your grasp of economics.
- ***Questions*** A comprehensive list of study questions is located at the end of each chapter. Each question is keyed to a particular learning objective (LO) in the list of LOs at the beginning of the chapter. Several of the questions are designated Key Questions and therefore are particularly important. At the Internet site is a multiple-choice quiz for each chapter.
- ***Study Guide*** We enthusiastically recommend the *Study Guide* accompanying this text. This "portable tutor" contains not only a broad sampling of various kinds of questions but a host of useful learning aids. Software-driven tutorials (*Homework Manager for Economics*, for example) are also available with the text.

Our two main goals are to help you understand and apply economics and help you improve your analytical skills. An understanding of economics will enable you to comprehend a whole range of economic, social, and political problems that otherwise would seem puzzling and perplexing. Also, your study will enhance reasoning skills that are highly prized in the workplace.

Good luck with your study. We think it will be well worth your time and effort.

IN THIS CHAPTER YOU WILL LEARN:

1. **The definition of economics and the features of the economic perspective.**
2. **The role of economic theory in economics.**
3. **The distinction between microeconomics and macroeconomics.**
4. **The categories of scarce resources and the nature of the economizing problem.**
5. **About production possibilities analysis, increasing opportunity costs, and economic growth.**
6. **(Appendix) About graphs, curves, and slopes as they relate to economics.**



1

Limits, Alternatives, and Choices

(An appendix on understanding graphs follows this chapter. If you need a quick review of this mathematical tool, you might benefit by reading the appendix first.) People's wants are numerous and varied. Biologically, people need only air, water, food, clothing, and shelter. But in modern society people also desire goods and services that provide a more comfortable or affluent standard of living. We want bottled water, soft drinks, and fruit juices, not just water from the creek. We want salads, burgers, and pizzas, not just berries and nuts. We want jeans, suits, and coats, not just woven reeds. We want apartments, condominiums, or houses, not just mud huts. And, as the saying goes, "that is not the half of it." We also want flat-panel TVs, Internet service, education, homeland security, cell phones, health care, and much more.

Fortunately, society possesses productive resources, such as labor and managerial talent, tools and machinery, and land and mineral deposits. These resources, employed in the economic system (or simply the economy), help us produce goods and services that satisfy many of our economic wants.

ORIGIN OF THE IDEA

O 1.1

Origin of the term "Economics"

But the blunt reality is that our economic wants far exceed the productive capacity of our scarce (limited) resources. We are forced to make choices. This unyielding truth underlies the definition of **economics,** which is the social science concerned with how individuals, institutions, and society make optimal (best) choices under conditions of scarcity.

The Economic Perspective

Economists view things from a unique perspective. This **economic perspective,** or economic way of thinking, has several critical and closely interrelated features.

Scarcity and Choice

From our definition of economics, we can easily see why economists view the world through the lens of scarcity. Scarce economic resources mean limited goods and services. Scarcity restricts options and demands choices. Because we "can't have it all," we must decide what we will have and what we must forgo.

At the core of economics is the idea that "there is no free lunch." You may be treated to lunch, making it "free" from your perspective, but someone bears a cost. Because all resources are either privately or collectively owned by members of society, ultimately society bears the cost. Scarce inputs of land, equipment, farm labor, the labor of cooks and waiters, and managerial talent are required. Because society could have used these resources to produce something else, it sacrifices those other goods and services in making the lunch available. Economists call such sacrifices **opportunity costs:** To obtain more of one thing, society forgoes the opportunity of getting the next best thing. That sacrifice is the opportunity cost of the choice.

CONSIDER THIS . . .

Free for All?

Free products are seemingly everywhere. Sellers offer free software, free cell phones, and free checking accounts. Dentists give out free toothbrushes. At state visitor centers, there are free brochures and maps.

Does the presence of so many free products contradict the economist's assertion "There is no free lunch"? No! Resources are used to produce each of these products, and because those resources have alternative uses, society gives up something else to get the "free" good. Where resources are used to produce goods or services, there is no free lunch.

So why are these goods offered for free? In a word: marketing! Firms sometimes offer free products to entice people to try them, hoping they will then purchase those goods later. The free software may eventually entice you to buy the producer's upgraded software. In other instances, the free brochures contain advertising for shops and restaurants, and that free e-mail program is filled with ads. In still other cases, the product is free only in conjunction with a larger purchase. To get the free bottle of soda, you must buy the large pizza. To get the free cell phone, you need to sign up for a year's worth of cell phone service.

So "free" products may or may not be truly free to individuals. They are never free to society.

PurposefulB ehavior

Economics assumes that human behavior reflects "rational self-interest." Individuals look for and pursue opportunities to increase their **utility**—the pleasure, happiness, or satisfaction obtained from consuming a good or service. They allocate their time, energy, and money to maximize their satisfaction. Because they weigh costs and benefits, their economic decisions are "purposeful" or "rational," not "random" or "chaotic."

ORIGIN OF THE IDEA

O 1.2

Utility

Consumers are purposeful in deciding what goods and services to buy. Business firms are purposeful in deciding what products to produce and how to produce them. Government entities are purposeful in deciding what public services to provide and how to finance them.

"Purposeful behavior" does not assume that people and institutions are immune from faulty logic and therefore are perfect decision makers. They sometimes make mistakes. Nor does it mean that people's decisions are unaffected by emotion or the decisions of those around them. "Purposeful behavior" simply means that people make decisions with some desired outcome in mind.

Rational self-interest is not the same as selfishness. In the economy, increasing one's own wage, rent, interest, or

profit normally requires identifying and satisfying *somebody else's* wants! Also, people make personal sacrifices to others. They contribute time and money to charities because they derive pleasure from doing so. Parents help pay for their children's education for the same reason. These self-interested, but unselfish, acts help maximize the givers' satisfaction as much as any personal purchase of goods or services. Self-interested behavior is simply behavior designed to increase personal satisfaction, however it may be derived.

CONSIDER THIS . . .

Fast-Food Lines

The economic perspective is useful in analyzing all sorts of behaviors. Consider an everyday example: the behavior of fast-food customers. When customers enter the restaurant, they go to the shortest line, believing that line will minimize their time cost of obtaining food. They are acting purposefully; time is limited, and people prefer using it in some way other than standing in line.

If one fast-food line is temporarily shorter than other lines, some people will move to that line. These movers apparently view the time saving from the shorter line (marginal benefit) as exceeding the cost of moving from their present line (marginal cost). The line switching tends to equalize line lengths. No further movement of customers between lines occurs once all lines are about equal.

Fast-food customers face another cost-benefit decision when a clerk opens a new station at the counter. Should they move to the new station or stay put? Those who shift to the new line decide that the time saving from the move exceeds the extra cost of physically moving. In so deciding, customers must also consider just how quickly they can get to the new station compared with others who may be contemplating the same move. (Those who hesitate in this situation are lost!)

Customers at the fast-food establishment do not have perfect information when they select lines. Thus, not all decisions turn out as expected. For example, you might enter a short line and find someone in front of you is ordering hamburgers and fries for 40 people in the Greyhound bus parked out back (and the employee is a trainee)! Nevertheless, at the time you made your decision, you thought it was optimal.

Finally, customers must decide what food to order when they arrive at the counter. In making their choices, they again compare marginal costs and marginal benefits in attempting to obtain the greatest personal satisfaction for their expenditure.

Economists believe that what is true for the behavior of customers at fast-food restaurants is true for economic behavior in general. Faced with an array of choices, consumers, workers, and businesses rationally compare marginal costs and marginal benefits in making decisions.

MarginalA nalysis: Benefits and Costs

The economic perspective focuses largely on **marginal analysis**—comparisons of marginal benefits and marginal costs, usually for decision making. To economists, "marginal" means "extra," "additional," or "a change in." Most choices or decisions involve changes in the status quo, meaning the existing state of affairs.

Should you attend school for another year? Should you study an extra hour for an exam? Should you supersize your fries? Similarly, should a business expand or reduce its output? Should government increase or decrease its funding for a missile defense system?

Each option involves marginal benefits and, because of scarce resources, marginal costs. In making choices rationally, the decision maker must compare those two amounts. Example: You and your fiancée are shopping for an engagement ring. Should you buy a $\frac{1}{2}$-carat diamond, a $\frac{5}{8}$-carat diamond, a $\frac{3}{4}$-carat diamond, a 1-carat diamond, or something even larger? The marginal cost of a larger-size diamond is the added expense beyond the cost of the smaller-size diamond. The marginal benefit is the perceived lifetime pleasure (utility) from the larger-size stone. If the marginal benefit of the larger diamond exceeds its marginal cost (and you can afford it), buy the larger stone. But if the marginal cost is more than the marginal benefit, buy the smaller diamond instead, even if you can afford the larger stone!

ORIGIN OF THE IDEA

O 1.3

Marginal analysis

In a world of scarcity, the decision to obtain the marginal benefit associated with some specific option always includes the marginal cost of forgoing something else. The money spent on the larger-size diamond means forgoing some other product. An opportunity cost—the value of the next best thing forgone—is always present whenever a choice is made. **(Key Question 3)**

Theories, Principles, and Models

Like the physical and life sciences, as well as other social sciences, economics relies on the **scientific method.** That procedure consists of several elements:

- Observing real-world behavior and outcomes.
- Based on those observations, formulating a possible explanation of cause and effect (hypothesis).

- Testing this explanation by comparing the outcomes of specific events to the outcome predicted by the hypothesis.
- Accepting, rejecting, and modifying the hypothesis, based on these comparisons.
- Continuing to test the hypothesis against the facts. As favorable results accumulate, the hypothesis evolves into a theory. A very well-tested and widely accepted theory is referred to as an economic law or an **economic principle**—a statement about economic behavior or the economy that enables prediction of the probable effects of certain actions. Combinations of such laws or principles are incorporated into models, which are simplified representations of how something works, such as a market or segment of the economy.

Economists develop theories of the behavior of individuals (consumers, workers) and institutions (businesses, governments) engaged in the production, exchange, and consumption of goods and services. Theories, principles, and models are "purposeful simplifications." The full scope of economic reality itself is too complex and bewildering to be understood as a whole. In developing theories, principles, and models economists remove the clutter and simplify.

Economic principles and models are highly useful in analyzing economic behavior and understanding how the economy operates. They are the tools for ascertaining cause and effect (or action and outcome) within the economic system. Good theories do a good job of explaining and predicting. They are supported by facts concerning how individuals and institutions actually behave in producing, exchanging, and consuming goods and services.

There are some other things you should know about economic principles.

- ***Generalizations*** Economic principles are generalizations relating to economic behavior or to the economy itself. Economic principles are expressed as the tendencies of typical or average consumers, workers, or business firms. For example, economists say that consumers buy more of a particular product when its price falls. Economists recognize that some consumers may increase their purchases by a large amount, others by a small amount, and a few not at all. This "price-quantity" principle, however, holds for the typical consumer and for consumers as a group.
- ***Other-Things-Equal Assumption*** In constructing their theories, economists use the *ceteris paribus* or **other-things-equal assumption**—the assumption that factors other than those being considered do not change. They assume that all variables except those under immediate consideration are held constant for a particular analysis. For example, consider the relationship between the price of Pepsi and the amount of it purchased. Assume that of all the factors that might influence the amount of Pepsi purchased (for example, the price of Pepsi, the price of Coca-Cola, and consumer incomes and preferences), only the price of Pepsi varies. This is helpful because the economist can then focus on the relationship between the price of Pepsi and purchases of Pepsi in isolation without being confused by changes in other variables.

ORIGIN OF THE IDEA
O 1.4
Ceteris paribus

- ***Graphical Expression*** Many economic models are expressed graphically. Be sure to read the special appendix at the end of this chapter as a review of graphs.

Microeconomicsan d Macroeconomics

Economists develop economic principles and models at two levels.

Microeconomics

Microeconomics is the part of economics concerned with individual units such as a person, a household, a firm, or an industry. At this level of analysis, the economist observes the details of an economic unit, or very small segment of the economy, under a figurative microscope. In microeconomics we look at decision making by individual customers, workers, households, and business firms. We measure the price of a specific product, the number of workers employed by a single firm, the revenue or income of a particular firm or household, or the expenditures of a specific firm, government entity, or family. In microeconomics, we examine the sand, rock, and shells, not the beach.

Macroeconomics

Macroeconomics examines either the economy as a whole or its basic subdivisions or aggregates, such as the government, household, and business sectors. An **aggregate** is a collection of specific economic units treated as if they were one unit. Therefore, we might lump together the millions

of consumers in the U.S. economy and treat them as if they were one huge unit called "consumers."

In using aggregates, macroeconomics seeks to obtain an overview, or general outline, of the structure of the economy and the relationships of its major aggregates. Macroeconomics speaks of such economic measures as total output, total employment, total income, aggregate expenditures, and the general level of prices in analyzing various economic problems. No or very little attention is given to specific units making up the various aggregates.

Figuratively, macroeconomics looks at the beach, not the pieces of sand, the rocks, and the shells.

The micro–macro distinction does not mean that economics is so highly compartmentalized that every topic can be readily labeled as either micro or macro; many topics and subdivisions of economics are rooted in both. Example: While the problem of unemployment is usually treated as a macroeconomic topic (because unemployment relates to aggregate production), economists recognize that the decisions made by *individual* workers on how long to search for jobs and the way *specific* labor markets encourage or impede hiring are also critical in determining the unemployment rate. **(Key Question 5)**

Positive and Normative Economics

Both microeconomics and macroeconomics contain elements of positive economics and normative economics. **Positive economics** focuses on facts and cause-and-effect relationships. It includes description, theory development, and theory testing (theoretical economics). Positive economics avoids value judgments, tries to establish scientific statements about economic behavior, and deals with what the economy is actually like. Such scientific-based analysis is critical to good policy analysis.

Economic policy, on the other hand, involves **normative economics,** which incorporates value judgments about what the economy should be like or what particular policy actions should be recommended to achieve a desirable goal (policy economics). Normative economics looks at the desirability of certain aspects of the economy. It underlies expressions of support for particular economic policies.

Positive economics concerns *what is*, whereas normative economics embodies subjective feelings about *what ought to be*. Examples: Positive statement: "The unemployment rate in France is higher than that in the United States." Normative statement: "France ought to undertake policies to make its labor market more flexible to reduce unemployment rates." Whenever words such as "ought" or "should" appear in a sentence, you are very likely encountering a normative statement.

Most of the disagreement among economists involves normative, value-based policy questions. Of course, economists sometime disagree about which theories or models best represent the economy and its parts, but they agree on a full range of economic principles. Most economic controversy thus reflects differing opinions or value judgments about what society should be like.

QUICK REVIEW 1.1

- Economics examines how individuals, institutions, and society make choices under conditions of scarcity.
- The economic perspective stresses (a) resource scarcity and the necessity of making choices, (b) the assumption of purposeful (or rational) behavior, and (c) comparisons of marginal benefit and marginal cost.
- In choosing among alternatives, people incur opportunity costs—the value of their next-best option.
- Economists use the scientific method to establish economic theories—cause-effect generalizations about the economic behavior of individuals and institutions.
- Microeconomics focuses on specific decision-making units of the economy, macroeconomics examines the economy as a whole.
- Positive economics deals with factual statements ("what is"); normative economics involves value judgments ("what ought to be").

Individuals' Economizing Problem

A close examination of the **economizing problem**—the need to make choices because economic wants exceed economic means—will enhance your understanding of economic models and the difference between microeconomic and macroeconomic analysis. Let's first build a microeconomic model of the economizing problem faced by an individual.

Limited Income

We all have a finite amount of income, even the wealthiest among us. Even Donald Trump must decide how to spend his money! And the majority of us have much more limited means. Our income comes to us in the form of wages, interest, rent, and profit, although we may also receive money from government programs or family members. As Global Perspective 1.1 shows, the average income of Americans in 2006 was $44,970. In the poorest nations, it was less than $500.

GLOBAL PERSPECTIVE 1.1

Average Income, Selected Nations

Average income (total income/population) and therefore typical individual budget constraints vary greatly among nations.

Country	Per Capita Income, 2006 (U.S. dollars, based on exchange rates)
Switzerland	$57,230
United States	44,970
Japan	38,410
France	36,550
South Korea	17,690
Mexico	7,870
Brazil	4,730
China	2,010
Pakistan	770
Nigeria	640
Rwanda	250
Liberia	140

Source: World Bank, **www.worldbank.org.**

Unlimited Wants

For better or worse, most people have virtually unlimited wants. We desire various goods and services that provide utility. Our wants extend over a wide range of products, from *necessities* (for example, food, shelter, and clothing) to *luxuries* (for example, perfumes, yachts, and sports cars). Some wants such as basic food, clothing, and shelter have biological roots. Other wants, for example, specific kinds of food, clothing, and shelter, arise from the conventions and customs of society.

Over time, as new and improved products are introduced, economic wants tend to change and multiply. Only recently have people wanted iPods, Internet service, digital cameras, or camera phones because those products did not exist a few decades ago. Also, the satisfaction of certain wants may trigger others: the acquisition of a Ford Focus or a Honda Civic has been known to whet the appetite for a Lexus or a Mercedes.

Services, as well as goods, satisfy our wants. Car repair work, the removal of an inflamed appendix, legal and accounting advice, and haircuts all satisfy human wants. Actually, we buy many goods, such as automobiles and washing machines, for the services they render. The differences between goods and services are often smaller than they appear to be.

For most people, the desires for goods and services cannot be fully satisfied. Bill Gates may have all that he wants for himself, but his massive charitable giving suggests that he keenly wants better health care for the world's poor. Our desires for a particular good or service can be satisfied; over a short period of time we can surely get enough toothpaste or pasta. And one appendectomy is plenty. But our broader desire for more goods and services and higher-quality goods and services seems to be another story.

Because we have only limited income (usually through our work) but seemingly insatiable wants, it is in our self-interest to economize: to pick and choose goods and services that maximize our satisfaction.

A Budget Line

We can clarify the economizing problem facing consumers by visualizing a **budget line** (or, more technically, a *budget constraint*). It is a schedule or curve that shows various combinations of two products a consumer can purchase with a specific money income. Although we assume two products, the analysis generalizes to the full range of products available to an individual consumer.

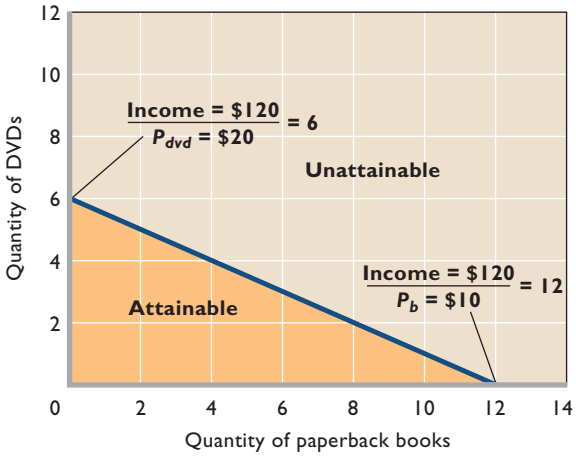
To understand the idea of a budget line, suppose that you received a Barnes & Noble (or Borders) gift card as a birthday present. The $120 card is soon to expire. You take the card to the store and confine your purchase decisions to two alternatives: DVDs and paperback books. DVDs are $20 each and paperback books are $10 each. Your purchase options are shown in the table in Figure 1.1.

At one extreme, you might spend all of your $120 "income" on 6 DVDs at $20 each and have nothing left to spend on books. Or, by giving up 2 DVDs and thereby gaining $40, you can have 4 DVDs at $20 each and 4 books at $10 each. And so on to the other extreme, at which you could buy 12 books at $10 each, spending your entire gift card on books with nothing left to spend on DVDs.

The graph in Figure 1.1 shows the budget line. Note that the graph is not restricted to whole units of DVDs and books as is the table. Every point on the graph represents a possible combination of DVDs and books, including fractional quantities. The slope of the graphed budget line measures the ratio of the price of books (P_b) to the price of DVDs (P_{dvd}); more precisely, the slope is $P_b/P_{dvd} = \$-10/\$+20 = -\frac{1}{2}$, or $-.5$. So you must forgo

FIGURE 1.1 A consumer's budget line. The budget line (or budget constraint) shows all the combinations of any two products that can be purchased, given the prices of the products and the consumer's money income.

The Budget Line: Whole-Unit Combinations of DVDs and Paperback Books Attainable with an Income of $120		
Units of DVDs (Price = $20)	Units of Books (Price = $10)	Total Expenditure
6	0	($120 = $120 + $0)
5	2	($120 = $100 + $20)
4	4	($120 = $80 + $40)
3	6	($120 = $60 + $60)
2	8	($120 = $40 + $80)
1	10	($120 = $20 + $100)
0	12	($120 = $0 + $120)



1 DVD (measured on the vertical axis) to buy 2 books (measured on the horizontal axis). This yields a slope of $-\frac{1}{2}$ or $-.5$.

The budget line illustrates several ideas.

Attainable and Unattainable Combinations

All the combinations of DVDs and books on or inside the budget line are *attainable* from the $120 of money income. You can afford to buy, for example, 3 DVDs at $20 each and 6 books at $10 each. You also can obviously afford to buy 2 DVDs and 5 books, if so desired, and not use up the value on the gift card. But to achieve maximum utility you will want to spend the full $120.

In contrast, all combinations beyond the budget line are *unattainable*. The $120 limit simply does not allow you to purchase, for example, 5 DVDs at $20 each and 5 books at $10 each. That $150 expenditure would clearly exceed the $120 limit. In Figure 1.1 the attainable combinations are on and within the budget line; the unattainable combinations are beyond the budget line.

Trade-Offs and Opportunity Costs

The budget line in Figure 1.1 illustrates the idea of trade-offs arising from limited income. To obtain more DVDs, you have to give up some books. For example, to obtain the first DVD, you trade off 2 books. So the opportunity cost of the first DVD is 2 books. To obtain the second DVD the opportunity cost is also 2 books. The straight-line budget constraint, with its constant slope, indicates constant opportunity cost. That is, the opportunity cost of 1 extra DVD remains the same (= 2 books) as more DVDs are

ORIGIN OF THE IDEA

O 1.5

Opportunity costs

CONSIDER THIS . . .

Did Gates, Winfrey, and Rodriguez Make Bad Choices?

Opportunity costs come into play in decisions well beyond simple buying decisions. Consider the different choices people make with respect to college. College graduates usually earn about 50 percent more during their lifetimes than persons with just high school diplomas. For most capable students, "Go to college, stay in college, and earn a degree" is very sound advice.

Yet Microsoft cofounder Bill Gates and talk show host Oprah Winfrey* both dropped out of college, and baseball star Alex Rodriguez ("A-Rod") never even bothered to start classes. What were they thinking? Unlike most students, Gates faced enormous opportunity costs for staying in college. He had a vision for his company, and his starting work young helped ensure Microsoft's success. Similarly, Winfrey landed a spot in local television news when she was a teenager, eventually producing and starring in the *Oprah Winfrey Show* when she was 32 years old. Getting a degree in her twenties might have interrupted the string of successes that made her famous talk show possible. And Rodriguez knew that professional athletes have short careers. Therefore, going to college directly after high school would have taken away four years of his peak earning potential.

So Gates, Winfrey, and Rodriguez understood opportunity costs and made their choices accordingly. The size of opportunity costs greatly matters in making individual decisions.

*Winfrey eventually went back to school and earned a degree from Tennessee State University when she was in her thirties.

purchased. And, in reverse, the opportunity cost of 1 extra book does not change (= $\frac{1}{2}$ DVD) as more books are bought.

Choice Limited income forces people to choose what to buy and what to forgo to fulfill wants. You will select the combination of DVDs and paperback books that you think is "best." That is, you will evaluate your marginal benefits and marginal costs (here, product price) to make choices that maximize your satisfaction. Other people, with the same $120 gift card, would undoubtedly make different choices.

Income Changes The location of the budget line varies with money income. An increase in money income shifts the budget line to the right; a decrease in money income shifts it to the left. To verify this, recalculate the table in Figure 1.1, assuming the card value (income) is (a) $240 and (b) $60, and plot the new budget lines in the graph. No wonder people like to have more income: That shifts their budget lines outward and enables them to buy more goods and services. But even with more income, people will still face spending trade-offs, choices, and opportunity costs. **(Key Question 7)**

WORKED PROBLEMS

W 1.1
Budget lines

QUICK REVIEW 1.2

- Because wants exceed incomes, individuals face an economizing problem; they must decide what to buy and what to forgo.
- A budget line (budget constraint) shows the various combinations of two goods that a consumer can purchase with a specific money income.
- Straight-line budget constraints imply constant opportunity costs associated with obtaining more of either of the two goods.

Society's Economizing Problem

Society must also make choices under conditions of scarcity. It, too, faces an economizing problem. Should it devote more of its limited resources to the criminal justice system (police, courts, and prisons) or to education (teachers, books, and schools)? If it decides to devote more resources to both, what other goods and services does it forgo? Health care? Energy development?

Resources

Society has limited or scarce **economic resources,** meaning all natural, human, and manufactured resources that go into the production of goods and services. This includes the entire set of factory and farm buildings and all the equipment, tools, and machinery used to produce manufactured goods and agricultural products; all transportation and communication facilities; all types of labor; and land and mineral resources.

Resource Categories

Economists classify economic resources into four general categories.

Land Land means much more to the economist than it does to most people. To the economist **land** includes all natural resources ("gifts of nature") used in the production process, such as arable land, forests, mineral and oil deposits, and water resources.

Labor The resource **labor** consists of the physical and mental talents of individuals used in producing goods and services. The services of a logger, retail clerk, machinist, teacher, professional football player, and nuclear physicist all fall under the general heading "labor."

Capital For economists, **capital** (or capital goods) includes all manufactured aids used in producing consumer goods and services. Included are all factory, storage, transportation, and distribution facilities, as well as tools and machinery. Economists refer to the purchase of capital goods as **investment.**

Capital goods differ from consumer goods because consumer goods satisfy wants directly, whereas capital goods do so indirectly by aiding the production of consumer goods. Note that the term "capital" as used by economists refers not to money but to tools, machinery, and other productive equipment. Because money produces nothing, economists do not include it as an economic resource. Money (or money capital or financial capital) is simply a means for purchasing capital goods.

Entrepreneurial Ability Finally, there is the special human resource, distinct from labor, called **entrepreneurial ability.** The entrepreneur performs several functions:

- The entrepreneur takes the initiative in combining the resources of land, labor, and capital to produce a good or a service. Both a sparkplug and a catalyst, the entrepreneur is the driving force behind production and the agent who combines the other resources in what is hoped will be a successful business venture.

- The entrepreneur makes the strategic business decisions that set the course of an enterprise.
- The entrepreneur is an innovator. He or she commercializes new products, new production techniques, or even new forms of business organization.
- The entrepreneur is a risk bearer. The entrepreneur has no guarantee of profit. The reward for the entrepreneur's time, efforts, and abilities may be profits or losses. The entrepreneur risks not only his or her invested funds but those of associates and stockholders as well.

Because land, labor, capital, and entrepreneurial ability are combined to produce goods and services, they are called the **factors of production,** or simply "inputs."

Production Possibilities Model

Society uses its scarce resources to produce goods and services. The alternatives and choices it faces can best be understood through a macroeconomic model of production possibilities. To keep things simple, let's initially assume:

- ***Full employment*** The economy is employing all its available resources.
- ***Fixed resources*** The quantity and quality of the factors of production are fixed.
- ***Fixed technology*** The state of technology (the methods used to produce output) is constant.
- ***Two goods*** The economy is producing only two goods: pizzas and industrial robots. Pizzas symbolize **consumer goods,** products that satisfy our wants directly; industrial robots (for example, the kind used to weld automobile frames) symbolize **capital goods,** products that satisfy our wants indirectly by making possible more efficient production of consumer goods.

ProductionP ossibilities Table

A production possibilities table lists the different combinations of two products that can be produced with a specific set of resources, assuming full employment. Table 1.1 presents a simple, hypothetical economy that is producing pizzas and industrial robots; the data are, of course, hypothetical. At alternative A, this economy would be devoting all its available resources to the production of industrial robots (capital goods); at alternative E, all resources would go to pizza production (consumer goods). Those alternatives are unrealistic extremes; an economy typically produces both capital goods and consumer goods, as in B, C, and D. As we move from alternative A to E, we increase the production of pizzas at the expense of the production of industrial robots.

TABLE 1.1 Production Possibilities of Pizzas and Industrial Robots

	Production Alternatives				
Type of Product	A	B	C	D	E
Pizzas (in hundred thousands)	0	1	2	3	4
Robots (in thousands)	10	9	7	4	0

Because consumer goods satisfy our wants directly, any movement toward E looks tempting. In producing more pizzas, society increases the current satisfaction of its wants. But there is a cost: More pizzas mean fewer industrial robots. This shift of resources to consumer goods catches up with society over time because the stock of capital goods does not expand at the current rate, with the result that some potential for greater future production is lost. By moving toward alternative E, society chooses "more now" at the expense of "much more later."

By moving toward A, society chooses to forgo current consumption, thereby freeing up resources that can be used to increase the production of capital goods. By building up its stock of capital this way, society will have greater future production and, therefore, greater future consumption. By moving toward A, society is choosing "more later" at the cost of "less now."

Generalization: At any point in time, a fully employed economy must sacrifice some of one good to obtain more of another good. Scarce resources prohibit such an economy from having more of both goods. Society must choose among alternatives. There is no such thing as a free pizza, or a free industrial robot. Having more of one thing means having less of something else.

Production Possibilities Curve

The data presented in a production possibilities table are shown graphically as a **production possibilities curve.** Such a curve displays the different combinations of goods and services that society can produce in a fully employed economy, assuming a fixed availability of supplies of resources and constant technology. We arbitrarily represent the economy's output of capital goods (here, industrial robots) on the vertical axis and the output of consumer goods (here, pizzas) on the horizontal axis, as shown in **Figure 1.2 (Key Graph).**

INTERACTIVE GRAPHS
G 1.1
Production possibilities curve

Each point on the production possibilities curve represents some maximum output of the two products.

keygraph

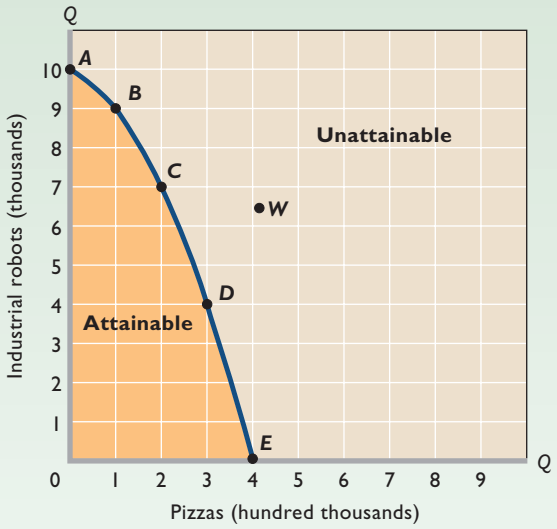


FIGURE 1.2 The production possibilities curve. Each point on the production possibilities curve represents some maximum combination of two products that can be produced if resources are fully employed. When an economy is operating on the curve, more industrial robots means fewer pizzas, and vice versa. Limited resources and a fixed technology make any combination of industrial robots and pizzas lying outside the curve (such as at *W*) unattainable. Points inside the curve are attainable, but they indicate that full employment is not being realized.

QUICK QUIZ FOR FIGURE 1.2

1. Production possibilities curve *ABCDE* is bowed out from the origin because:
   - **a.** the marginal benefit of pizzas declines as more pizzas are consumed.
   - **b.** the curve gets steeper as we move from *E* to *A*.
   - **c.** it reflects the law of increasing opportunity costs.
   - **d.** resources are scarce.
2. The marginal opportunity cost of the second unit of pizza is:
   - **a.** 2 units of robots.
   - **b.** 3 units of robots.
   - **c.** 7 units of robots.
   - **d.** 9 units of robots.
3. The total opportunity cost of 7 units of robots is:
   - **a.** 1 unit of pizza.
   - **b.** 2 units of pizza.
   - **c.** 3 units of pizza.
   - **d.** 4 units of pizza.
4. All points on this production possibilities curve necessarily represent:
   - **a.** society's optimal choice.
   - **b.** less than full use of resources.
   - **c.** unattainable levels of output.
   - **d.** full employment.

Answers: 1. c; 2. a; 3. b; 4. d

The curve is a "constraint" because it shows the limit of attainable outputs. Points on the curve are attainable as long as the economy uses all its available resources. Points lying inside the curve are also attainable, but they reflect less total output and therefore are not as desirable as points on the curve. Points inside the curve imply that the economy could have more of both industrial robots and pizzas if it achieved full employment of its resources. Points lying beyond the production possibilities curve, like *W*, would represent a greater output than the output at any point on the curve. Such points, however, are unattainable with the current availability of resources and technology.

Lawofln creasing Opportunity Costs

Figure 1.2 clearly shows that more pizzas means fewer industrial robots. The number of units of industrial robots that must be given up to obtain another unit of pizzas, of course, is the opportunity cost of that unit of pizzas.

In moving from alternative A to alternative B in Table 1.1, the cost of 1 additional unit of pizzas is 1 fewer unit of industrial robots. But when additional units are considered—B to C, C to D, and D to E—an important economic principle is revealed: For society, the opportunity cost of each additional unit of pizzas is greater than the opportunity cost of the preceding one. When we move from A to B, just

1 unit of industrial robots is sacrificed for 1 more unit of pizzas; but in going from B to C we sacrifice 2 additional units of industrial robots for 1 more unit of pizzas; then 3 more of industrial robots for 1 more of pizzas; and finally 4 for 1. Conversely, confirm that as we move from E to A, the cost of an additional unit of industrial robots (on average) is $\frac{1}{4}$, $\frac{1}{3}$, $\frac{1}{2}$, and 1 unit of pizzas, respectively, for the four successive moves.

Our example illustrates the **law of increasing opportunity costs.** As the production of a particular good increases, the opportunity cost of producing an additional unit rises.

Shape of the Curve

The law of increasing opportunity costs is reflected in the shape of the production possibilities curve: The curve is bowed out from the origin of the graph. Figure 1.2 shows that when the economy moves from *A* to *E*, it must give up successively larger amounts of industrial robots (1, 2, 3, and 4) to acquire equal increments of pizzas (1, 1, 1, and 1). This is shown in the slope of the production possibilities curve, which becomes steeper as we move from *A* to *E*.

Economic Rationale

The economic rationale for the law of increasing opportunity costs is that economic resources are not completely adaptable to alternative uses. Many resources are better at producing one type of good than at producing others. Some land is highly suited to growing the ingredients necessary for pizza production, but as pizza production expands society has to start using land that is less bountiful for farming. Other land is rich in mineral deposits and therefore well-suited to producing the materials needed to make industrial robots. As society steps up the production of robots, it must use land that is less and less adaptable to making their components.

If we start at *A* and move to *B* in Figure 1.2, we can shift resources whose productivity is relatively high in pizza production and low in industrial robots. But as we move from *B* to *C*, *C* to *D*, and so on, resources highly productive of pizzas become increasingly scarce. To get more pizzas, resources whose productivity in industrial robots is relatively great will be needed. Increasingly more of such resources, and hence greater sacrifices of industrial robots, will be needed to achieve each 1-unit increase in pizzas. This lack of perfect flexibility, or interchangeability, on the part of resources is the cause of increasing opportunity costs for society. **(Key Question 10)**

WORKED PROBLEMS

W 1.2

Production possibilities

Optimal Allocation

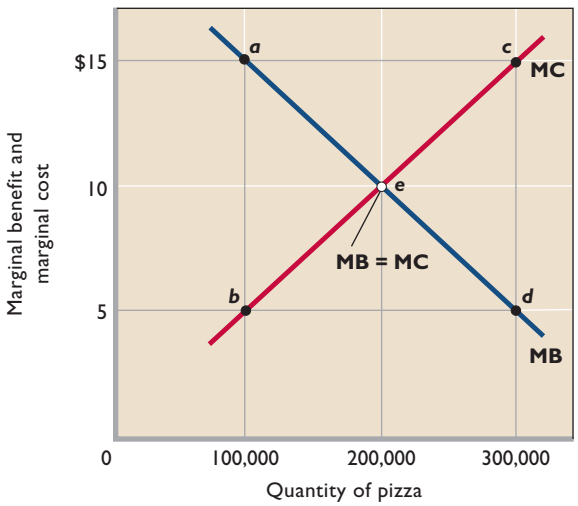
Of all the attainable combinations of pizzas and industrial robots on the curve in Figure 1.2, which is optimal (best)? That is, what specific quantities of resources should be allocated to pizzas and what specific quantities should be allocated to industrial robots in order to maximize satisfaction?

Recall that economic decisions center on comparisons of marginal benefit (MB) and marginal cost (MC). Any economic activity should be expanded as long as marginal benefit exceeds marginal cost and should be reduced if marginal cost exceeds marginal benefit. The optimal amount of the activity occurs where MB = MC. Society needs to make a similar assessment about its production decision.

Consider pizzas. We already know from the law of increasing opportunity costs that the marginal costs of additional units of pizza will rise as more units are produced. At the same time, we need to recognize that the extra or marginal benefits that come from producing and consuming pizza decline with each successive unit of pizza. Consequently, each successive unit of pizza brings with it both increasing marginal costs and decreasing marginal benefits.

The optimal quantity of pizza production is indicated by point *e* at the intersection of the MB and MC curves: 200,000 units in Figure 1.3. Why is this amount the optimal quantity? If only 100,000 units of pizzas were produced, the marginal benefit of an extra unit of pizza (point *a*) would

FIGURE 1.3 Optimal output: MB = MC. Achieving the optimal output requires the expansion of a good's output until its marginal benefit (MB) and marginal cost (MC) are equal. No resources beyond that point should be allocated to the product. Here, optimal output occurs at point *e*, where 200,000 units of pizzas are produced.



exceed its marginal cost (point *b*). In money terms, MB is $15, while MC is only $5. When society gains something worth $15 at a marginal cost of only $5, it is better off. In Figure 1.3, net gains can continue to be realized until pizza-product production has been increased to 200,000.

CONSIDER THIS . . .

The Economics of War

Production possibilities analysis is helpful in assessing the costs and benefits of waging the broad war on terrorism, including the wars in Afghanistan and Iraq. At the end of 2007, the estimated cost of these efforts exceeded $400 billion.

If we categorize all U.S. production as either "defense goods" or "civilian goods," we can measure them on the axes of a production possibilities diagram such as that shown in Figure 1.2. The opportunity cost of using more resources for defense goods is the civilian goods sacrificed. In a fully employed economy, more defense goods are achieved at the opportunity cost of fewer civilian goods—health care, education, pollution control, personal computers, houses, and so on. The cost of war and defense is the other goods forgone. The benefits of these activities are numerous and diverse but clearly include the gains from protecting against future loss of American lives, assets, income, and well-being.

Society must assess the marginal benefit (MB) and marginal cost (MC) of additional defense goods to determine their optimal amounts—where to locate on the defense goods–civilian goods production possibilities curve. Although estimating marginal benefits and marginal costs is an imprecise art, the MB-MC framework is a useful way of approaching choices. An optimal allocation of resources requires that society expand production of defense goods until MB = MC.

The events of September 11, 2001, and the future threats they foreshadowed increased the marginal benefits of defense goods, as perceived by Americans. If we label the horizontal axis in Figure 1.3 "defense goods" and draw in a rightward shift of the MB curve, you will see that the optimal quantity of defense goods rises. In view of the concerns relating to September 11, the United States allocated more of its resources to defense. But the MB-MC analysis also reminds us we can spend too much on defense, as well as too little. The United States should not expand defense goods beyond the point where MB = MC. If it does, it will be sacrificing civilian goods of greater value than the defense goods obtained.

In contrast, the production of 300,000 units of pizzas is excessive. There the MC of an added unit is $15 (point *c*) and its MB is only $5 (point *d*). This means that 1 unit of pizza is worth only $5 to society but costs it $15 to obtain. This is a losing proposition for society!

So resources are being efficiently allocated to any product when the marginal benefit and marginal cost of its output are equal (MB = MC). Suppose that by applying the same analysis to industrial robots, we find that the optimal (MB = MC) output of robots is 7000. This would mean that alternative *C* (200,000 units of pizzas and 7000 units of industrial robots) on the production possibilities curve in Figure 1.2 would be optimal for this economy. **(Key Question 11)**

QUICK REVIEW 1.3

- Economists categorize economic resources as land, labor, capital, and entrepreneurial ability.
- The production possibilities curve illustrates several ideas: (a) scarcity of resources is implied by the area of unattainable combinations of output lying outside the production possibilities curve; (b) choice among outputs is reflected in the variety of attainable combinations of goods lying along the curve; (c) opportunity cost is illustrated by the downward slope of the curve; (d) the law of increasing opportunity costs is implied by the bowed-outward shape of the curve.
- A comparison of marginal benefits and marginal costs is needed to determine the best or optimal output mix on a production possibilities curve.

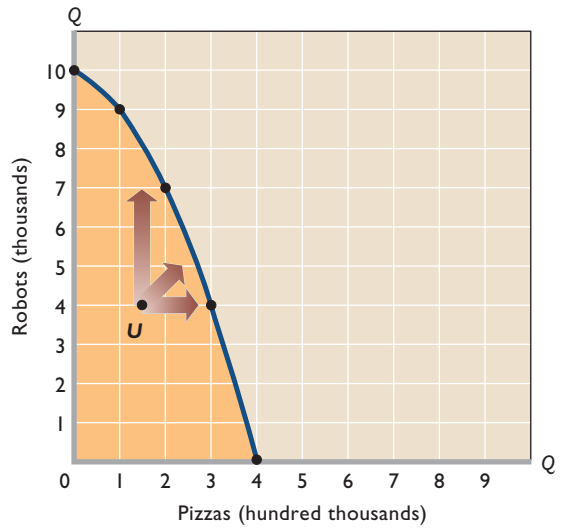
Unemployment, Growth, and the Future

In the depths of the Great Depression of the 1930s, one-quarter of U.S. workers were unemployed and one-third of U.S. production capacity was idle. The United States has suffered a number of considerably milder downturns since then, one occurring in 2001. In that year total production fell one-half a percentage point and unemployment increased by about 2 million workers.

Almost all nations have experienced widespread unemployment and unused production capacity from business downturns at one time or another. Since 1995, for example, several nations—including Argentina, Japan, Mexico, Germany, and South Korea—have had economic downturns and unemployment.

How do these realities relate to the production possibilities model? Our analysis and conclusions change if we

FIGURE 1.4 Unemployment and the production possibilities curve. Any point inside the production possibilities curve, such as *U*, represents unemployment or a failure to achieve full employment. The arrows indicate that by realizing full employment, the economy could operate on the curve. This means it could produce more of one or both products than it is producing at point *U*.



relax the assumption that all available resources are fully employed. The five alternatives in Table 1.1 represent maximum outputs; they illustrate the combinations of pizzas and industrial robots that can be produced when the economy is operating at full employment. With unemployment, this economy would produce less than each alternative shown in the table.

Graphically, we represent situations of unemployment by points inside the original production possibilities curve (reproduced here in Figure 1.4). Point *U* is one such point. Here the economy is falling short of the various maximum combinations of pizzas and industrial robots represented by the points on the production possibilities curve. The arrows in Figure 1.4 indicate three possible paths back to full employment. A move toward full employment would yield a greater output of one or both products.

AGr owingE conomy

When we drop the assumptions that the quantity and quality of resources and technology are fixed, the production possibilities curve shifts positions and the potential maximum output of the economy changes.

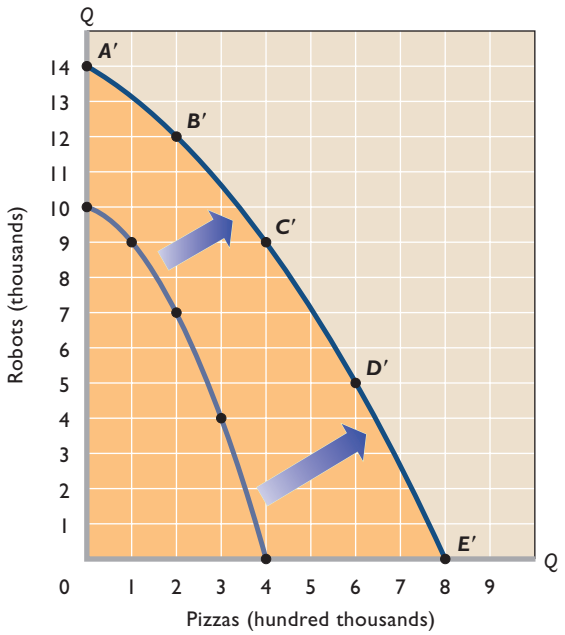
Increases in Resource Supplies

Although resource supplies are fixed at any specific moment, they change over time. For example, a nation's growing population brings about increases in the supplies of labor and entrepreneurial ability. Also, labor quality usually improves over time via more education and training. Historically, the economy's stock of capital has increased at a significant, though unsteady, rate. And although some of our energy and mineral resources are being depleted, new sources are also being discovered. The development of irrigation programs, for example, adds to the supply of arable land.

The net result of these increased supplies of the factors of production is the ability to produce more of both consumer goods and capital goods. Thus, 20 years from now, the production possibilities may supersede those shown in Table 1.1. The new production possibilities might look like those in the table in Figure 1.5. The greater abundance of resources will result in a greater potential output of one or both products at each alternative. The economy will have achieved economic growth in the form of expanded potential output. Thus, when an increase in the quantity or quality of resources occurs, the production possibilities curve shifts outward and to the right, as illustrated by the move from the inner curve to curve $A'B'C'D'E'$ in Figure 1.5. This sort of

FIGURE 1.5 Economic growth and the production possibilities curve. The increase in supplies of resources, improvements in resource quality, and technological advances that occur in a dynamic economy move the production possibilities curve outward and to the right, allowing the economy to have larger quantities of both types of goods.

	Production Alternatives				
Type of Product	**A′**	**B′**	**C′**	**D′**	**E′**
Pizzas (in hundred thousands)	0	2	4	6	8
Robots (in thousands)	14	12	9	5	0



LAST Word

Pitfalls to Sound Economic Reasoning

Because They Affect Us So Personally, We Often Have Difficulty Thinking Accurately and Objectively About Economic Issues.

Here are some common pitfalls to avoid in successfully applying the economic perspective.

Biases Most people bring a bundle of biases and preconceptions to the field of economics. For example, some might think that corporate profits are excessive or that lending money is always superior to borrowing money. Others might believe that government is necessarily less efficient than businesses or that more government regulation is always better than less. Biases cloud thinking and interfere with objective analysis. All of us must be willing to shed biases and preconceptions that are not supported by facts.

Loaded Terminology The economic terminology used in newspapers and broadcast media is sometimes emotionally biased, or loaded. The writer or spokesperson may have a cause to promote or an ax to grind and may slant comments accordingly. High profits may be labeled "obscene," low wages may be called "exploitive," or self-interested behavior may be "greed." Government workers may be referred to as "mindless bureaucrats" and those favoring stronger government regulations may be called "socialists." To objectively analyze economic issues, you must be prepared to reject or discount such terminology.

Fallacy of Composition Another pitfall in economic thinking is the assumption that what is true for one individual or part of a whole is necessarily true for a group of individuals or the whole. This is a logical fallacy called the *fallacy of composition;* the assumption is not correct. A statement that is valid for an individual or part is not necessarily valid for the larger group or whole. You may see the action better if you leap to your feet to see an outstanding play at a football game. But if all the

shift represents growth of economic capacity, which, when used, means **economic growth:** a larger total output.

Advances in Technology

An advancing technology brings both new and better goods and improved ways of producing them. For now, let's think of technological advance as being only improvements in the methods of production, for example, the introduction of computerized systems to manage inventories and schedule production. These advances alter our previous discussion of the economizing problem by allowing society to produce more goods with available resources. As with increases in resource supplies, technological advances make possible the production of more industrial robots and more pizzas.

A real-world example of improved technology is the recent surge of new technologies relating to computers, communications, and biotechnology. Technological advances have dropped the prices of computers and greatly increased their speed. Improved software has greatly increased the everyday usefulness of computers. Cellular phones and the Internet have increased communications capacity, enhancing production and improving the efficiency of markets. Advances in biotechnology have resulted in important agricultural and medical discoveries. These and other new and improved technologies have contributed to U.S. economic growth (outward shifts of the nation's production possibilities curve.)

Conclusion: Economic growth is the result of (1) increases in supplies of resources, (2) improvements in resource quality, and (3) technological advances. The consequence of growth is that a full-employment economy can enjoy a greater output of both consumption goods and capital goods. Whereas static, no-growth economies must sacrifice some of one good to obtain more of another, dynamic, growing economies can have larger quantities of both goods. **(Key Question 13)**

spectators leap to their feet at the same time, nobody—including you—will have a better view than when all remained seated.

Here are two economic examples: An individual stockholder can sell shares of, say, Google stock without affecting the price of the stock. The individual's sale will not noticeably reduce the share price because the sale is a negligible fraction of the total shares of Google being bought and sold. But if all the Google shareholders decide to sell their shares the same day, the market will be flooded with shares and the stock price will fall precipitously. Similarly, a single cattle ranch can increase its revenue by expanding the size of its livestock herd. The extra cattle will not affect the price of cattle when they are brought to market. But if all ranchers as a group expand their herds, the total output of cattle will increase so much that the price of cattle will decline when the cattle are sold. If the price reduction is relatively large, ranchers as a group might find that their income has fallen despite their having sold a greater number of cattle because the fall in price overwhelms the increase in quantity.

Post Hoc Fallacy You must think very carefully before concluding that because event A precedes event B, A is the cause of B. This kind of faulty reasoning is known as the *post hoc, ergo propter hoc*, or "after this, therefore because of this," fallacy. Noneconomic example: A professional football team hires a new coach and the team's record improves. Is the new coach the cause? Maybe. Perhaps the presence of more experienced and talented players or an easier schedule is the true cause. The rooster crows before dawn but does not cause the sunrise.

Economic example: Many people blamed the Great Depression of the 1930s on the stock market crash of 1929. But the crash did not cause the Great Depression. The same severe weaknesses in the economy that caused the crash caused the Great Depression. The depression would have occurred even without the preceding stock market crash.

Correlation but Not Causation Do not confuse correlation, or connection, with causation. Correlation between two events or two sets of data indicates only that they are associated in some systematic and dependable way. For example, we may find that when variable *X* increases, *Y* also increases. But this correlation does not necessarily mean that there is causation—that increases in *X* cause increases in *Y*. The relationship could be purely coincidental or dependent on some other factor, *Z*, not included in the analysis.

Here is an example: Economists have found a positive correlation between education and income. In general, people with more education earn higher incomes than those with less education. Common sense suggests education is the cause and higher incomes are the effect; more education implies a more knowledgeable and productive worker, and such workers receive larger salaries.

But might the relationship be explainable in other ways? Are education and income correlated because the characteristics required for succeeding in education—ability and motivation—are the same ones required to be a productive and highly paid worker? If so, then people with those traits will probably both obtain more education and earn higher incomes. But greater education will not be the sole cause of the higher income.

Present Choices and Future Possibilities

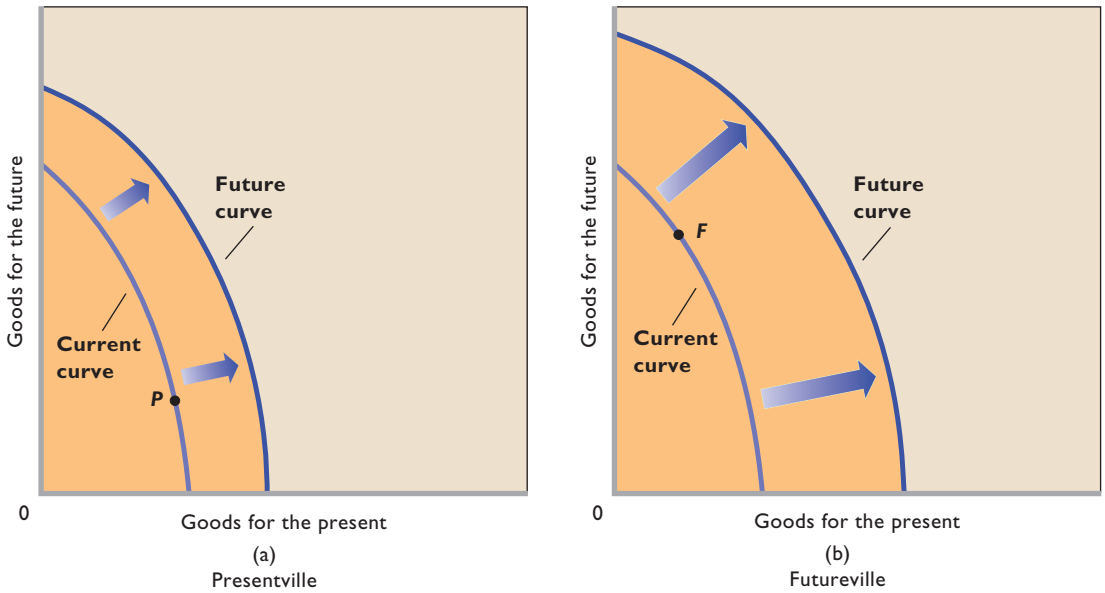
An economy's current choice of positions on its production possibilities curve helps determine the future location of that curve. Let's designate the two axes of the production possibilities curve as "goods for the future" and "goods for the present," as in Figure 1.6. Goods for the future are such things as capital goods, research and education, and preventive medicine. They increase the quantity and quality of property resources, enlarge the stock of technological information, and improve the quality of human resources. As we have already seen, goods for the future such as capital goods are the ingredients of economic growth. Goods for the present are consumer goods such as food, clothing, and entertainment.

Now suppose there are two hypothetical economies, Presentville and Futureville, that are initially identical in every respect except one: Presentville's current choice of positions on its production possibilities curve strongly favors present goods over future goods. Point *P* in Figure 1.6a indicates that choice. It is located quite far down the curve to the right, indicating a high priority for goods for the present, at the expense of fewer goods for the future. Futureville, in contrast, makes a current choice that stresses larger amounts of future goods and smaller amounts of present goods, as shown by point *F* in Figure 1.6b.

INTERACTIVE GRAPHS
G 1.2
Present choices and future possibilities

Now, other things equal, we can expect the future production possibilities curve of Futureville to be farther to the right than Presentville's curve. By currently choosing an output more favorable to technological advances and to increases in the quantity and quality of resources, Futureville will achieve greater economic

FIGURE 1.6 Present choices and future locations of production possibilities curves. A nation's current choice favoring "present goods," as made by Presentville in (a), will cause a modest outward shift of the production possibilities curve in the future. A nation's current choice favoring "future goods," as made by Futureville in (b), will result in a greater outward shift of the curve in the future.



growth than Presentville. In terms of capital goods, Futureville is choosing to make larger current additions to its "national factory" by devoting more of its current output to capital than Presentville. The payoff from this choice for Futureville is greater future production capacity and economic growth. The opportunity cost is fewer consumer goods in the present for Futureville to enjoy.

Is Futureville's choice thus necessarily "better" than Presentville's? That, we cannot say. The different outcomes simply reflect different preferences and priorities in the two countries. But each country will have to live with the economic consequences of its choice. **(Key Question 14)**

AQu alification: International Trade

Production possibilities analysis implies that an individual nation is limited to the combinations of output indicated by its production possibilities curve. But we must modify this principle when international specialization and trade exist.

You will see in later chapters that an economy can circumvent, through international specialization and trade, the output limits imposed by its domestic production possibilities curve. International specialization means directing domestic resources to output that a nation is highly efficient at producing. International trade involves the exchange of these goods for goods produced abroad. Specialization and trade enable a nation to get more of a desired good at less sacrifice of some other good. Rather than sacrifice three units of robots to get a third unit of pizza, as in Table 1.1, a nation might be able to obtain the third unit of pizza by trading only two units of robots for it. Specialization and trade have the same effect as having more and better resources or discovering improved production techniques; both increase the quantities of capital and consumer goods available to society. Expansion of domestic production possibilities and international trade are two separate routes for obtaining greater output.

QUICK REVIEW 1.4

- Unemployment causes an economy to operate at a point inside its production possibilities curve.
- Increases in resource supplies, improvements in resource quality, and technological advance cause economic growth, which is depicted as an outward shift of the production possibilities curve.
- An economy's present choice of capital and consumer goods helps determine the future location of its production possibilities curve.
- International specialization and trade enable a nation to obtain more goods than its production possibilities curve indicates.

Summary

1. Economics is the social science that examines how individuals, institutions, and society make optimal choices under conditions of scarcity. Central to economics is the idea of opportunity cost: the value of the good, service, or time forgone to obtain something else.
2. The economic perspective includes three elements: scarcity and choice, purposeful behavior, and marginal analysis. It sees individuals and institutions making rational decisions based on comparisons of marginal costs and marginal benefits.
3. Economists employ the scientific method, in which they form and test hypotheses of cause-and-effect relationships to generate theories, laws, and principles. Economists often combine theories into representations called models.
4. Microeconomics examines the decision making of specific economic units or institutions. Macroeconomics looks at the economy as a whole or its major aggregates.
5. Positive economic analysis deals with facts; normative economics reflects value judgments.
6. Individuals face an economizing problem. Because their wants exceed their incomes, they must decide what to purchase and what to forgo. Society also faces an economizing problem. Societal wants exceed the available resources necessary to fulfill them. Society therefore must decide what to produce and what to forgo.
7. Graphically, a budget line (or budget constraint) illustrates the economizing problem for individuals. The line shows the various combinations of two products that a consumer can purchase with a specific money income, given the prices of the two products.
8. Economic resources are inputs into the production process and can be classified as land, labor, capital, or entrepreneurial ability. Economic resources are also known as factors of production or inputs.
9. Economists illustrate society's economizing problem through production possibilities analysis. Production possibilities tables and curves show the different combinations of goods and services that can be produced in a fully employed economy, assuming that resource quantity, resource quality, and technology are fixed.
10. An economy that is fully employed and thus operating on its production possibilities curve must sacrifice the output of some types of goods and services to increase the production of others. The gain of one type of good or service is always accompanied by an opportunity cost in the form of the loss of some of the other type.
11. Because resources are not equally productive in all possible uses, shifting resources from one use to another creates increasing opportunity costs. The production of additional units of one product requires the sacrifice of increasing amounts of the other product.
12. The optimal (best) point on the production possibilities curve represents the most desirable mix of goods and is determined by expanding the production of each good until its marginal benefit (MB) equals its marginal cost (MC).
13. Over time, technological advances and increases in the quantity and quality of resources enable the economy to produce more of all goods and services, that is, to experience economic growth. Society's choice as to the mix of consumer goods and capital goods in current output is a major determinant of the future location of the production possibilities curve and thus of the extent of economic growth.
14. International trade enables nations to obtain more goods from their limited resources than their production possibilities curve indicates.

Terms and Concepts

economics
economic perspective
opportunity cost
utility
marginal analysis
scientific method
economic principle
other-things-equal assumption
microeconomics
macroeconomics
aggregate
positive economics
normative economics
economizing problem
budget line
economic resources
land
labor
capital
investment
entrepreneurial ability
factors of production
consumer goods
capital goods
production possibilities curve
law of increasing opportunity costs
economic growth

Study Questions

1. What is an opportunity cost? How does the idea relate to the definition of economics? Which of the following decisions would entail the greater opportunity cost: Allocating a square block in the heart of New York City for a surface parking lot or allocating a square block at the edge of a typical suburb for such a lot? Explain. **LO1**
2. What is meant by the term "utility" and how does the idea relate to purposeful behavior? **LO2**
3. **KEY QUESTION** Cite three examples of recent decisions that you made in which you, at least implicitly, weighed marginal cost and marginal benefit. **LO1**
4. What are the key elements of the scientific method and how does this method relate to economic principles and laws? **LO2**
5. **KEY QUESTION** Indicate whether each of the following statements applies to microeconomics or macroeconomics: **LO3**
   a. The unemployment rate in the United States was 4.9 percent in January 2008.
   b. A U.S. software firm discharged 15 workers last month and transferred the work to India.
   c. An unexpected freeze in central Florida reduced the citrus crop and caused the price of oranges to rise.
   d. U.S. output, adjusted for inflation, grew by 2.2 percent in 2007.
   e. Last week Wells Fargo Bank lowered its interest rate on business loans by one-half of 1 percentage point.
   f. The consumer price index rose by 2.8 percent in 2007.
6. State (a) a positive economic statement of your choice, and then (b) a normative economic statement relating to your first statement. **LO2**
7. **KEY QUESTION** Suppose you won $15 on a lotto ticket at the local 7-Eleven and decided to spend all the winnings on candy bars and bags of peanuts. The price of candy bars is $.75 and the price of peanuts is $1.50. **LO4**
   a. Construct a table showing the alternative combinations of the two products that are available.
   b. Plot the data in your table as a budget line in a graph. What is the slope of the budget line? What is the opportunity cost of one more candy bar? Of one more bag of peanuts? Do these opportunity costs rise, fall, or remain constant as each additional unit of the product is purchased?
   c. How, in general, would you decide which of the available combinations of candy bars and bags of peanuts to buy?
   d. Suppose that you had won $30 on your ticket, not $15. Show the $30 budget line in your diagram. Why would this budget line be preferable to the old one?
8. What are economic resources? What categories do economists use to classify them? Why are resources also called factors of production? Why are they called inputs? **LO4**
9. Why is money not considered to be a capital resource in economics? Why is entrepreneurial ability considered a category of economic resource, distinct from labor? What are the major functions of the entrepreneur? **LO4**
10. **KEY QUESTION** Below is a production possibilities table for consumer goods (automobiles) and capital goods (forklifts): **LO5**

	Production Alternatives				
Type of Production	A	B	C	D	E
Automobiles	0	2	4	6	8
Forklifts	30	27	21	12	0

    a. Show these data graphically. Upon what specific assumptions is this production possibilities curve based?
    b. If the economy is at point *C*, what is the cost of one more automobile? Of one more forklift? Explain how the production possibilities curve reflects the law of increasing opportunity costs.
    c. If the economy characterized by this production possibilities table and curve were producing 3 automobiles and 20 fork lifts, what could you conclude about its use of its available resources?
    d. What would production at a point outside the production possibilities curve indicate? What must occur before the economy can attain such a level of production?
11. **KEY QUESTION** Specify and explain the typical shapes of marginal-benefit and marginal-cost curves. How are these curves used to determine the optimal allocation of resources to a particular product? If current output is such that marginal cost exceeds marginal benefit, should more or fewer resources be allocated to this product? Explain. **LO5**
12. Explain how (if at all) each of the following events affects the location of a country's production possibilities curve: **LO5**
    a. The quality of education increases.
    b. The number of unemployed workers increases.
    c. A new technique improves the efficiency of extracting copper from ore.
    d. A devastating earthquake destroys numerous production facilities.
13. **KEY QUESTION** Referring to the table in question 10, suppose improvement occurs in the technology of producing forklifts but not in the technology of producing automobiles. Draw the new production possibilities curve. Now assume that a technological advance occurs in producing automobiles but not in producing forklifts. Draw the new production possibilities curve. Now draw a production possibilities curve that reflects technological improvement in the production of both goods. **LO5**
14. **KEY QUESTION** On average, households in China save 40 percent of their annual income each year, whereas households in the United States save less than 5 percent. Production possibilities are growing at roughly 9 percent annually in China and 3.5 percent in the United States. Use graphical analysis of "present goods" versus "future goods" to explain the differences in growth rates. **LO5**

15. Suppose that, on the basis of a nation's production possibilities curve, an economy must sacrifice 10,000 pizzas domestically to get the 1 additional industrial robot it desires but that it can get the robot from another country in exchange for 9000 pizzas. Relate this information to the following statement: "Through international specialization and trade, a nation can reduce its opportunity cost of obtaining goods and thus 'move outside its production possibilities curve.'" **LO5**

16. **LAST WORD** Studies indicate that married men on average earn more income than unmarried men of the same age and education level. Why must we be cautious in concluding that marriage is the cause and higher income is the effect?

Web-Based Questions

1. **NORMATIVE ECONOMICS—REPUBLICANS VERSUS DEMOCRATS** Visit both the Republicans' **www.rnc.org** and the Democrats' **www.democrats.org** Web sites. Identify an economic issue that both parties address and compare and contrast their views on that issue. Generally speaking, how much of the disagreement is based on normative economics compared to positive economics? Give an example of loaded terminology from each site.

2. **MORE LABOR RESOURCES—WHAT IS THE EVIDENCE FOR THE UNITED STATES AND JAPAN?** Go to the Bureau of Labor Statistics' Web site at **www.bls.gov** and select Get Detailed Statistics. Look for Labor Force Statistics from the Current Population Survey and click the Most Requested Statistics icon. Find U.S. civilian employment data for the last 10 years. How many more workers were there at the end of the 10-year period than at the beginning? Next, return to the Detailed Statistics page. Use the Most Requested Statistics icon next to Foreign Labor Statistics (it's under Productivity and Technology) to find total employment growth in Japan over the last 10 years. In which of the two countries did "more labor resources" have the greatest impact in shifting the nation's production possibilities curve outward over the 10-year period?

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Graphs and Their Meaning

If you glance quickly through this text, you will find many graphs. Some seem simple, while others seem more formidable. All are included to help you visualize and understand economic relationships. Physicists and chemists sometimes illustrate their theories by building arrangements of multicolored wooden balls, representing protons, neutrons, and electrons, that are held in proper relation to one another by wires or sticks. Economists most often use graphs to illustrate their models. By understanding these "pictures," you can more readily comprehend economic relationships. Most of our principles or models explain relationships between just two sets of economic facts, which can be conveniently represented with two-dimensional graphs.

Construction of a Graph

A *graph* is a visual representation of the relationship between two variables. The table in Figure 1 is a hypothetical illustration showing the relationship between income and consumption for the economy as a whole. Without even studying economics, we would logically expect that people would buy more goods and services when their incomes go up. Thus, it is not surprising to find in the table that total consumption in the economy increases as total income increases.

The information in the table is expressed graphically in Figure 1. Here is how it is done: We want to show visually how consumption changes as income changes. We therefore represent income on the **horizontal axis** of the graph and consumption on the **vertical axis.**

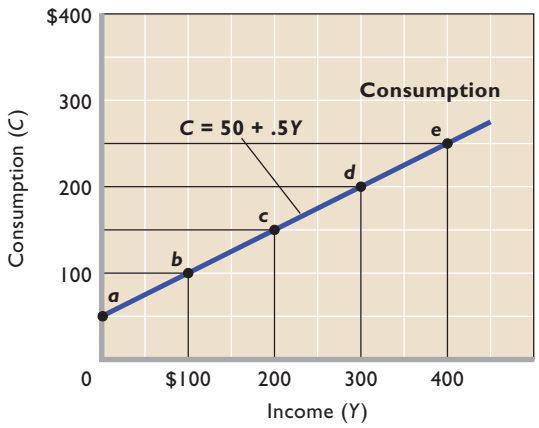
Now we arrange the vertical and horizontal scales of the graph to reflect the ranges of values of consumption and income and mark the scales in convenient increments. As you can see, the values marked on the scales cover all the values in the table. The increments on both scales are $100.

Because the graph has two dimensions, each point within it represents an income value and its associated consumption value. To find a point that represents one of the five income-consumption combinations in the table in Figure 1, we draw straight lines from the appropriate values on the vertical and horizontal axes. For example, to plot point *c* (the $200 income–$150 consumption point), we draw straight lines up from the horizontal (income) axis at $200 and across from the vertical (consumption) axis at $150. These lines intersect at point *c*, which represents this particular income-consumption combination. You should verify that the other income-consumption combinations shown in the table are properly located in the graph in Figure 1. Finally, by assuming that the same general relationship between income and consumption prevails for all other incomes, we draw a line or smooth curve to connect these points. That line or curve represents the income-consumption relationship.

If the curve is a straight line, as in Figure 1, we say the relationship is *linear.* (It is permissible, and even customary, to call straight lines in graphs "curves.")

FIGURE 1 Graphing the direct relationship between consumption and income. Two sets of data that are positively or directly related, such as consumption and income, graph as an upsloping line.

Income per Week	Consumption per Week	Point
$ 0	$ 50	*a*
100	100	*b*
200	150	*c*
300	200	*d*
400	250	*e*



Direct and Inverse Relationships

The line in Figure 1 slopes upward to the right, so it depicts a direct relationship between income and consumption. By a **direct relationship** (or positive relationship) we mean that two variables—in this case, consumption and income—change in the *same* direction. An increase in consumption is associated with an increase in income; a decrease in consumption accompanies a decrease in income. When two sets of data are positively or directly related, they always graph as an *upsloping* line, as in Figure 1.

In contrast, two sets of data may be inversely related. Consider the table in Figure 2, which shows the relationship between the price of basketball tickets and game attendance at Gigantic State University (GSU). Here we have an **inverse relationship** (or negative relationship) because the two variables change in *opposite* directions. When ticket prices decrease, attendance increases. When ticket prices increase, attendance decreases. The six data points in the table in Figure 2 are plotted in the graph. Observe that an inverse relationship always graphs as a *downsloping* line.

Dependentan d Independent Variables

Although it is not always easy, economists seek to determine which variable is the "cause" and which is the "effect." Or, more formally, they seek the independent variable and the dependent variable. The **independent variable** is the cause or source; it is the variable that changes first. The **dependent variable** is the effect or outcome; it is the variable that changes because of the change in the independent variable. As in our income-consumption example, income generally is the independent variable and consumption the dependent variable. Income causes consumption to be what it is rather than the other way around. Similarly, ticket prices (set in advance of the season and printed on the ticket) determine attendance at GSU basketball games; attendance at games does not determine the printed ticket prices for those games. Ticket price is the independent variable and the quantity of tickets purchased is the dependent variable.

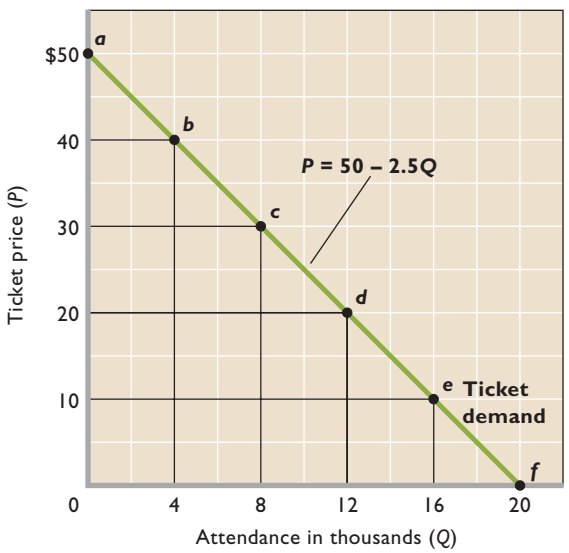
You may recall from your high school courses that mathematicians put the independent variable (cause) on the horizontal axis and the dependent variable (effect) on the vertical axis. Economists are less tidy; their graphing of independent and dependent variables is more arbitrary. Their conventional graphing of the income-consumption relationship is consistent with mathematical presentation, but economists put price and cost data on the vertical axis. Hence, economists' graphing of GSU's ticket price–attendance data differs from normal mathematical procedure. This does not present a problem, but we want you to be aware of this fact to avoid possible confusion.

Other ThingsE qual

Our simple two-variable graphs purposely ignore many other factors that might affect the amount of consump-

FIGURE 2 Graphing the inverse relationship between ticket prices and game attendance. Two sets of data that are negatively or inversely related, such as ticket price and the attendance at basketball games, graph as a downsloping line.

Ticket Price	Attendance, Thousands	Point
$50	0	*a*
40	4	*b*
30	8	*c*
20	12	*d*
10	16	*e*
0	20	*f*



tion occurring at each income level or the number of people who attend GSU basketball games at each possible ticket price. When economists plot the relationship between any two variables, they employ the *ceteris paribus* (other-things-equal) assumption. Thus, in Figure 1 all factors other than income that might affect the amount of consumption are presumed to be constant or unchanged. Similarly, in Figure 2 all factors other than ticket price that might influence attendance at GSU basketball games are assumed constant. In reality, "other things" are not equal; they often change, and when they do, the relationship represented in our two tables and graphs will change. Specifically, the lines we have plotted would shift to new locations.

Consider a stock market "crash." The dramatic drop in the value of stocks might cause people to feel less wealthy and therefore less willing to consume at each level of income. The result might be a downward shift of the consumption line. To see this, you should plot a new consumption line in Figure 1, assuming that consumption is, say, $20 less at each income level. Note that the relationship remains direct; the line merely shifts downward to reflect less consumption spending at each income level.

Similarly, factors other than ticket prices might affect GSU game attendance. If GSU loses most of its games, attendance at GSU games might be less at each ticket price. To see this, redraw Figure 2 assuming that 2000 fewer fans attend GSU games at each ticket price. **(Key Appendix Question 2)**

Slope of a Line

Lines can be described in terms of their slopes. The **slope of a straight line** is the ratio of the vertical change (the rise or drop) to the horizontal change (the run) between any two points of the line.

Positive Slope

Between point *b* and point *c* in Figure 1, the rise or vertical change (the change in consumption) is +$50 and the run or horizontal change (the change in income) is +$100. Therefore:

$$\text{Slope} = \frac{\text{vertical change}}{\text{horizontal change}} = \frac{+50}{+100} = \frac{1}{2} = .5$$

Note that our slope of $\frac{1}{2}$ or .5 is positive because consumption and income change in the same direction; that is, consumption and income are directly or positively related.

The slope of .5 tells us there will be a $1 increase in consumption for every $2 increase in income. Similarly, it indicates that for every $2 decrease in income there will be a $1 decrease in consumption.

Negative Slope

Between any two of the identified points in Figure 2, say, point *c* and point *d*, the vertical change is −10 (the drop) and the horizontal change is +4 (the run). Therefore:

$$\text{Slope} = \frac{\text{vertical change}}{\text{horizontal change}} = \frac{-10}{+4}$$

$$= -2\frac{1}{2} = -2.5$$

This slope is negative because ticket price and attendance have an inverse relationship.

Note that on the horizontal axis attendance is stated in thousands of people. So the slope of −10/+4 or −2.5 means that lowering the price by $10 will increase attendance by 4000 people. This is the same as saying that a $2.50 price reduction will increase attendance by 1000 persons.

Slopes and Measurement Units

The slope of a line will be affected by the choice of units for either variable. If, in our ticket price illustration, we had chosen to measure attendance in individual people, our horizontal change would have been 4000 and the slope would have been

$$\text{Slope} = \frac{-10}{+4000} = \frac{-1}{+400} = -.0025$$

The slope depends on the way the relevant variables are measured.

Slopes and Marginal Analysis

Recall that economics is largely concerned with changes from the status quo. The concept of slope is important in economics because it reflects marginal changes—those involving 1 more (or 1 less) unit. For example, in Figure 1 the .5 slope shows that $.50 of extra or marginal consumption is associated with each $1 change in income. In this example, people collectively will consume $.50 of any $1 increase in their incomes and reduce their consumption by $.50 for each $1 decline in income.

Infinite and Zero Slopes

Many variables are unrelated or independent of one another. For example, the quantity of wristwatches purchased is not related to the price of bananas. In Figure 3a we represent the price of bananas on the vertical axis and the quantity of watches demanded on

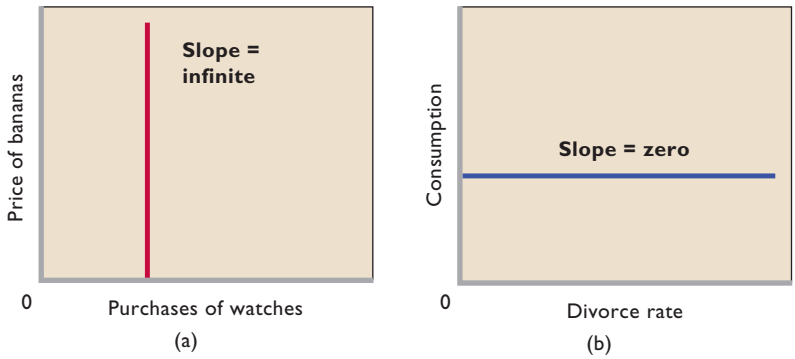


FIGURE 3 Infinite and zero slopes. (a) A line parallel to the vertical axis has an infinite slope. Here, purchases of watches remain the same no matter what happens to the price of bananas. (b) A line parallel to the horizontal axis has a slope of zero. In this case, consumption remains the same no matter what happens to the divorce rate. In both (a) and (b), the two variables are totally unrelated to one another.

the horizontal axis. The graph of their relationship is the line parallel to the vertical axis, indicating that the same quantity of watches is purchased no matter what the price of bananas. The slope of such a line is *infinite*.

Similarly, aggregate consumption is completely unrelated to the nation's divorce rate. In Figure 3b we put consumption on the vertical axis and the divorce rate on the horizontal axis. The line parallel to the horizontal axis represents this lack of relatedness. This line has a slope of *zero*.

VerticalIn tercept

A line can be located on a graph (without plotting points) if we know its slope and its vertical intercept. The **vertical intercept** of a line is the point where the line meets the vertical axis. In Figure 1 the intercept is \$50. This intercept means that if current income were zero, consumers would still spend \$50. They might do this through borrowing or by selling some of their assets. Similarly, the \$50 vertical intercept in Figure 2 shows that at a \$50 ticket price, GSU's basketball team would be playing in an empty arena.

Equation of a Linear Relationship

If we know the vertical intercept and slope, we can describe a line succinctly in equation form. In its general form, the equation of a straight line is

$$y = a + bx$$

where y = dependent variable
a = vertical intercept
b = slope of line
x = independent variable

For our income-consumption example, if C represents consumption (the dependent variable) and Y represents income (the independent variable), we can write $C = a + bY$. By substituting the known values of the intercept and the slope, we get

$$C = 50 + .5Y$$

This equation also allows us to determine the amount of consumption C at any specific level of income. You should use it to confirm that at the \$250 income level, consumption is \$175.

When economists reverse mathematical convention by putting the independent variable on the vertical axis and the dependent variable on the horizontal axis, then y stands for the independent variable, rather than the dependent variable in the general form. We noted previously that this case is relevant for our GSU ticket price–attendance data. If P represents the ticket price (independent variable) and Q represents attendance (dependent variable), their relationship is given by

$$P = 50 - 2.5Q$$

where the vertical intercept is 50 and the negative slope is $-2\frac{1}{2}$, or -2.5. Knowing the value of P lets us solve for Q, our dependent variable. You should use this equation to predict GSU ticket sales when the ticket price is \$15. **(Key Appendix Question 3)**

Slope of a Nonlinear Curve

We now move from the simple world of linear relationships (straight lines) to the more complex world of nonlinear relationships. The slope of a straight line is the same at all its points. The slope of a line representing a nonlinear relationship changes from one point to another. Such lines are always referred to as *curves*.

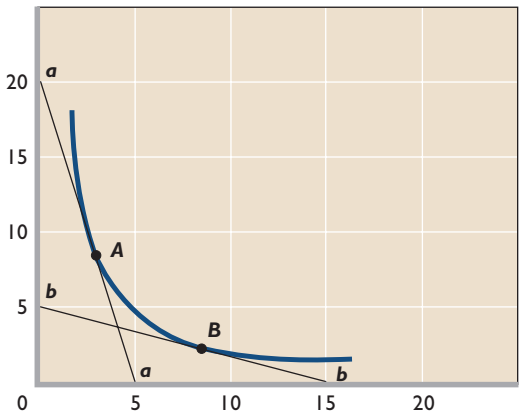
Consider the downsloping curve in Figure 4. Its slope is negative throughout, but the curve flattens as we move down along it. Thus, its slope constantly changes; the curve has a different slope at each point.

To measure the slope at a specific point, we draw a straight line tangent to the curve at that point. A line is *tangent* at a point if it touches, but does not intersect, the curve at that point. Thus line *aa* is tangent to the curve in Figure 4 at point *A*. The slope of the curve at that point is equal to the slope of the tangent line. Specifically, the total vertical change (drop) in the tangent line *aa* is −20 and the total horizontal change (run) is +5. Because the slope of the tangent line *aa* is −20/+5, or −4, the slope of the curve at point *A* is also −4.

INTERACTIVE GRAPHS
G 1.3
Curves and slopes

Line *bb* in Figure 4 is tangent to the curve at point *B*. Following the same procedure, we find the slope at *B* to be −5/+15, or $-\frac{1}{3}$. Thus, in this flatter part of the curve, the slope is less negative. **(Key Appendix Question 7)**

FIGURE 4 Determining the slopes of curves.
The slope of a nonlinear curve changes from point to point on the curve. The slope at any point (say, *B*) can be determined by drawing a straight line that is tangent to that point (line *bb*) and calculating the slope of that line.



Appendix Summary

1. Graphs are a convenient and revealing way to represent economic relationships.
2. Two variables are positively or directly related when their values change in the same direction. The line (curve) representing two directly related variables slopes upward.
3. Two variables are negatively or inversely related when their values change in opposite directions. The curve representing two inversely related variables slopes downward.
4. The value of the dependent variable (the "effect") is determined by the value of the independent variable (the "cause").
5. When the "other factors" that might affect a two-variable relationship are allowed to change, the graph of the relationship will likely shift to a new location.
6. The slope of a straight line is the ratio of the vertical change to the horizontal change between any two points. The slope of an upsloping line is positive; the slope of a downsloping line is negative.
7. The slope of a line or curve depends on the units used in measuring the variables. It is especially relevant for economics because it measures marginal changes.
8. The slope of a horizontal line is zero; the slope of a vertical line is infinite.
9. The vertical intercept and slope of a line determine its location; they are used in expressing the line—and the relationship between the two variables—as an equation.
10. The slope of a curve at any point is determined by calculating the slope of a straight line tangent to the curve at that point.

Appendix Terms and Concepts

horizontal axis
vertical axis
direct relationship
inverse relationship
independent variable
dependent variable
slope of a straight line
vertical intercept

Appendix Study Questions

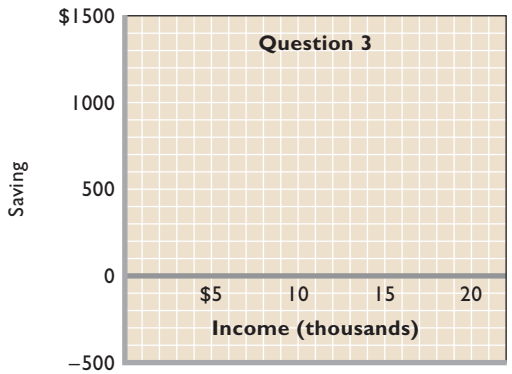
1. Briefly explain the use of graphs as a way to represent economic relationships. What is an inverse relationship? How does it graph? What is a direct relationship? How does it graph? Graph and explain the relationships you would expect to find between (*a*) the number of inches of rainfall per month and the sale of umbrellas, (*b*) the amount of tuition and the level of enrollment at a university, and (*c*) the popularity of an entertainer and the price of her concert tickets.

   In each case cite and explain how variables other than those specifically mentioned might upset the expected relationship. Is your graph in previous part *b* consistent with the fact that, historically, enrollments and tuition have both increased? If not, explain any difference. LO6

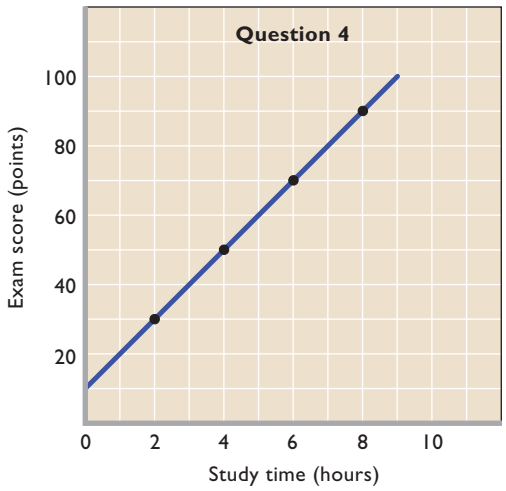
2. **KEY APPENDIX QUESTION** Indicate how each of the following might affect the data shown in the table and graph in Figure 2 of this appendix: LO6
   - **a.** GSU's athletic director schedules higher-quality opponents.
   - **b.** An NBA team locates in the city where GSU plays.
   - **c.** GSU contracts to have all its home games televised.

3. **KEY APPENDIX QUESTION** The following table contains data on the relationship between saving and income. Rearrange these data into a meaningful order and graph them on the accompanying grid. What is the slope of the line? The vertical intercept? Interpret the meaning of both the slope and the intercept. Write the equation that represents this line. What would you predict saving to be at the $12,500 level of income? LO6

Income per Year	Saving per Year
$15,000	$1,000
0	−500
10,000	500
5,000	0
20,000	1,500



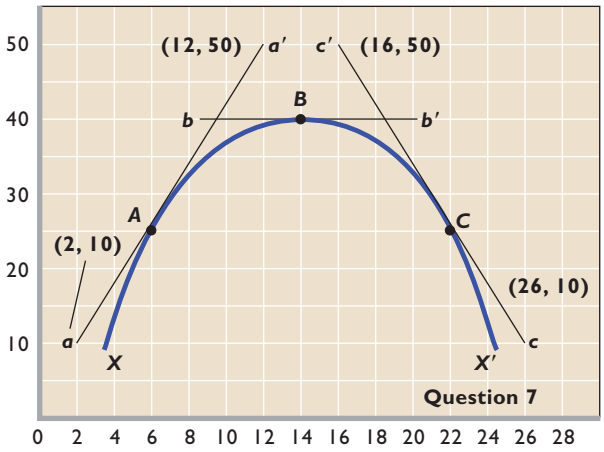
4. Construct a table from the data shown on the graph below. Which is the dependent variable and which the independent variable? Summarize the data in equation form. LO6



5. Suppose that when the interest rate on loans is 16 percent, businesses find it unprofitable to invest in machinery and equipment. However, when the interest rate is 14 percent, $5 billion worth of investment is profitable. At 12 percent interest, a total of $10 billion of investment is profitable. Similarly, total investment increases by $5 billion for each successive 2-percentage-point decline in the interest rate. Describe the relevant relationship between the interest rate and investment in words, in a table, on a graph, and as an equation. Put the interest rate on the vertical axis and investment on the horizontal axis. In your equation use the form $i = a + bI$, where i is the interest rate, a is the vertical intercept, b is the slope of the line (which is negative), and I is the level of investment. Comment on the advantages and disadvantages of the verbal, tabular, graphical, and equation forms of description. LO6

6. Suppose that $C = a + bY$, where C = consumption, a = consumption at zero income, b = slope, and Y = income. LO6
   - **a.** Are C and Y positively related or are they negatively related?
   - **b.** If graphed, would the curve for this equation slope upward or slope downward?
   - **c.** Are the variables C and Y inversely related or directly related?
   - **d.** What is the value of C if $a = 10$, $b = .50$, and $Y = 200$?
   - **e.** What is the value of Y if $C = 100$, $a = 10$, and $b = .25$?

7. KEY APPENDIX QUESTION The accompanying graph shows curve XX' and tangents at points A, B, and C. Calculate the slope of the curve at these three points. **LO6**



8. In the accompanying graph, is the slope of curve AA' positive or negative? Does the slope increase or decrease as we move along the curve from A to A'? Answer the same two questions for curve BB'. **LO6**