CHAPTER 1
THE ART AND SCIENCE OF ECONOMIC ANALYSIS

INTRODUCTION

This chapter has two purposes: to introduce students to some of the basic language of economics and to stimulate student interest in the subject. It conveys to students that economics is not only found in the financial section of the newspaper, but also is very much a part of their everyday lives. Beginning with the economic problem of scarce resources but unlimited wants, this chapter provides an overview of the field and the analytical techniques used. Concepts introduced include: *resources, goods and services*, the *economic decision makers* in the economy, and *marginal analysis*. Two models for analysis, the circular flow model and steps of the scientific method, are introduced. The Appendix introduces the use of graphs.

CHAPTER OUTLINE

I. The Economic Problem: Scarce Resources, Unlimited Wants

Economics is about making choices. The problem is that wants or desires are virtually unlimited while the resources available to satisfy these wants are scarce. A resource is scarce when it is not freely available, when its price exceeds zero. Economics studies how people use their scarce resources in an attempt to satisfy their unlimited wants.

A. Resources

The inputs, or factors of production, used to produce the goods and services that people want. Resources are divided into four categories:

1. **Labor**: Human effort, both physical and mental
2. **Capital**
   - *Physical capital*: Manufactured items (tools, buildings) used to produce goods and services.
   - *Human capital*: Knowledge and skills people acquire to increase their productivity.
3. **Natural resources**: gifts of nature, bodies of water, trees, oil reserves, minerals and animals.
   - These can be renewable or exhaustible.
4. **Entrepreneurial ability**: The imagination required to develop a new product or process, the skill needed to organize production, and the willingness to take the risk of profit or loss.
   - Payments for resources: Labor–wage; capital–interest; natural resources–rent; entrepreneurial ability–profit.

B. Goods and Services

- A *good* is something we can see, feel, and touch (i.e., corn). It requires scarce resources to produce and is used to satisfy human wants.
- A *service* is not tangible but requires scarce resources to produce and satisfy human wants (i.e. haircut).
- A good or service is *scarce* if the amount people desire exceeds the amount available at a price of zero. Goods and services that are truly free are not the subject matter of economics. Without scarcity, there would be no economic problem and no need for prices

- "There is no such thing as a free lunch." The lunch may seem free to you, but it draws scarce resources away from the production of other goods and services, and whoever provides a free lunch often expects something in return.

C. Economic Decision Makers and Markets

There are four types of decision makers:

1. Households. As consumers, demand goods and services produced. As resource owners, supply resources to the resource market.
2. Firms. Use resources that households supply and produce goods and services that households demand.
3. Governments. Use resources that households supply and produce goods and services that households demand.
4. The rest of the world. Use resources that households supply and produce goods and services that households demand.
    - **Markets:** *Buyers and sellers carry out exchanges in markets***.**
    - Goods and services are exchanged in product markets.
    - Labor, capital, natural resources, and entrepreneurial ability are exchanged in resource markets.

D. A Simple Circular Flow Model

- A simple circular flow model in *Exhibit 2* describes the flow of resources, products, income and revenue among economic decision makers.

II. The Art of Economic Analysis

A. Rational Self-Interest

- Economics assumes that individuals, in making choices, rationally select alternatives they perceive to be in their best interests.
    - *Rational* refers to people trying to make the best choices they can**,** given the available information.
- Each individual tries to minimize the expected cost of achieving a given benefit or to maximize the expected benefit achieved with a given cost**.**

B. Choice Requires Time and Information

Time and information are scarce and therefore valuable. Rational decision makers acquire information as long as the expected additional benefit from the information is greater than its expected additional cost.

C. Economic Analysis Is Marginal Analysis

A theory predicting that the standard of living in economies around the world will grow more similar over time, with poor countries eventually catching up with richer ones.

- Economic choice is based on the comparison of expected marginal cost and the expected marginal benefit.
- Marginal means incremental or additional.
- A rational decision maker changes the status quo if the expected marginal benefit from the information is greater than its expected marginal cost.

D. Microeconomics and Macroeconomics

- *Microeconomics*: The study of individual economic choices (e.g., your economic behavior, a company's economic behavior).
- *Macroeconomics:* The study of the performance of the economy as a whole, as measured, for example, by total production and employment.
- *Economic fluctuations*: The rise and fall of economic activity relative to the long-term growth trend of the economy; also called business cycles.

III. The Science of Economic Analysis

A. The Role of Theory

An economic theory, or economic model, is a simplification of economic reality that is used to make predictions about cause and effect in the real world. An economic theory captures the important elements of the problem under study.

B. The Scientific Method

A four-step process of theoretical investigation:

1. *Identify the question and define relevant variables.* A variable is a measure that can take on different values at different times.
2. *Specify assumptions:*
   - *Other-things-constant assumption:* Focuses on the relationships between the variables of interest, assuming that nothing else important changes (i.e., ceteris paribus).
   - *Behavioral assumptions:* Focus on how people will behave (i.e., in their rational self-interest).
3. *Formulate a hypothesis, a theory about how key variables relate to each other***.** The purpose of this hypothesis, like that of any theory, is to help make predictions about cause and effect in the real world
4. *Test the hypothesis*. Compare its predictions with evidence. The theory is then rejected, accepted, or modified and retested.

C. Normative Versus Positive

- A *positive* economic statement concerns what is; it can be supported or rejected by reference to facts.
- A *normative* economic statement concerns what should be; it reflects an opinion and cannot be shown to be true or false by reference to the facts.

D. Economists Tell Stories

- Economists explain their theories by telling stories about how they think the economy works. To tell a compelling story, an economist relies on case studies, anecdotes, parables, the personal experience of the listener, and supporting data

E. Predicting Average Behavior

- The task of an economic theory is to predict the impact of an economic event on economic choices and, in turn, the effect of these choices on particular markets or on the economy as a whole. Economists focus on the average, or typical, behavior of people in groups.

F. Some Pitfalls of Faulty Economic Analysis:

1. The fallacy that is association is causation: The fact that one event precedes another or that two events occur simultaneously does not mean that one caused the other.
2. The fallacy of composition: The incorrect belief that what is true for the individual, or the part, is true for the group, or the whole.
3. The mistake of ignoring secondary effects: (unintended consequences of policy)

G. If Economist Are So Smart, Why Aren't They Rich?

- Economists have been appointed to federal cabinet posts, as secretaries of commerce, defense, labor, state, treasury, and to head the U.S. Federal Reserve System.
- Economics is the only social science and the only business discipline for which the prestigious Nobel Prize is awarded, and pronouncements by economists are reported in the media daily.

***Case Study* :** *College Major and Annual Earnings*

IV. Conclusion

This textbook describes how economic factors affect individual choices and how all these choices come together to shape the economic system. Economics is not the whole story, and economic factors are not always the most important. But economic considerations have important and predictable effects on individual choices, and these choices affect the way we live.

Appendix: Understanding Graphs

Drawing Graphs

- **Origin**: The point of departure, the point from which all variables are measured.
- **Horizontal axis**: The value of the *x* variable increases as you move along this axis to the right of the origin; a straight line to the right of the origin.
- **Vertical axis**: The value of the *y* variable increases as you move upward and away from the origin; a straight line extending above the origin.
- Within the space framed by the axes, you can plot possible combinations of the variables measured along each axis.
- **Graph**: A picture showing how variables relate.
- **Time-series graph**: Shows the value of one or more variables over time.
- **Functional relation:** Exists between two variables when the value of one variable depends on the other variable (e.g., the value of the independent variable determines the value of the dependent variable).
- Types of relationships between variables:
  - **Positive, or direct, relation**: As one variable increases, the other variable increases.
  - **Negative, or inverse, relation**: As one variable increases, the other variable decreases.
  - **Independent, or unrelated relation**: As one variable increases, the other variable remains unchanged or unrelated.

The Slopes of Straight Lines

- The slope of a line measures how much the vertical variable (y) changes for each 1-unit change in the horizontal variable (x).
- The slope of a line is a convenient device for measuring marginal effects. Slope reflects the change in y for each one unit change in x.
- The slope of a line does not imply causality but indicates a relation between the variables.
- The slope of a line is the change in the vertical distance divided by the increase in the horizontal distance.
- The slope of a line depends on how units are measured; the mathematical value of the slope depends on the units of measurement in the graph.
- The slope of a straight line is the same everywhere along the line.
- The slope of a curved line varies from one point to another along the curve.
- If the slope is:
  - Positive: There is a positive or direct relation between the variables.
  - Negative: There is a negative or inverse relation between the variables.
  - Zero or assumed infinite: There is no relation between the variables; they are independent or unrelated.

The Slope, Units of Measurement, and Marginal Analysis

The Slopes of Curved Lines

- **Curve Shifts:** A change in an underlying assumption is expressed by a shift in the curve.

CHAPTER SUMMARY

Economics is the study of how people choose to use their scarce resources to produce, exchange, and consume goods and services in an attempt to satisfy unlimited wants. The economic problem arises from the conflict between scarce resources and unlimited wants. If wants were limited or if resources were not scarce, there would be no need to study economics.

Economic resources are combined in a variety of ways to produce goods and services. Major categories of resources include labor, capital, natural resources, and entrepreneurial ability. Because economic resources are scarce, only a limited number of goods and services can be produced with them. Therefore, goods and services are also scarce, so choices must be made.

Microeconomics focuses on choices made in households, firms, and governments and how these choices affect particular markets, such as the market for used cars. Choice is guided by rational self-interest. Choice typically requires time and information, both of which are scarce and valuable.

Whereas microeconomics examines the individual pieces of the puzzle, macroeconomics steps back to consider the big picture—the performance of the economy as a whole as reflected by such measures as total production, employment, the price level, and economic growth.

Economists use theories, or models, to help understand the effects of an economic change, such as a change in price or income, on individual choices and how these choices affect particular markets and the economy as a whole. Economists employ the scientific method to study an economic problem by (a) formulating the question and isolating relevant variables, (b) specifying the assumptions under which the theory operates, (c) developing a theory, or hypothesis, about how the variables relate, and (d) testing that theory by comparing its predictions with the evidence. A theory might not work perfectly, but it is useful as long as it predicts better than competing theories do.

Positive economics aims to discover how the economy works. Normative economics is concerned more with how, in someone's opinion, the economy should work. Those who are not careful can fall victim to the fallacy that association is causation, to the fallacy of composition, and to the mistake of ignoring secondary effects.

The appendix to this chapter deals with the construction and interpretation of graphs.

TEACHING POINTS

1. This course will provide the first exposure to the economic way of thinking for many of your students. Although it seems natural to you, economic analysis presents a formidable challenge to many students. You may wish to consider presenting economics as one of many approaches to describing human behavior rather than as a body of established doctrines. Introducing a topic with relevant questions to which economics provides an answer generally enhances student interest in economics. Such questions appear at the beginning of each chapter.

2. Students are generally eager and very fresh at the beginning of the semester. Chapters 1 and 2 can be assigned during the first week, and you can move almost immediately into discussions of production possibilities, the idea of opportunity cost, the use of marginal analysis, and comparative advantage (see Chapter 2). It should also be easy to meld a discussion of the points contained in the Chapter 1 Appendix with the analytics of Chapter 2.

3. One point to stress in discussing the role and importance of economic analysis is that, while individual responses to changes in an economic environment are not always predictable, the aggregate response often is. The use of such knowledge is valuable in virtually any context in which individuals, households, firms, resource owners, and so on, are faced with changing opportunities and costs. You might use some examples to illustrate this, such as what is the predicted response to a tax on gasoline and who ends up paying for the tax or the impact of a tax refund on consumer behavior.

4. From a purely analytical perspective, the most important concept introduced in this chapter is the idea that decisions are made on the basis of marginal analysis. You might stress that marginal analysis is a cornerstone of economics.

5. Some terminology in the text may deviate from your own lecture notes. If you intend to use any of the Test Banks, try to mention deviations between the text's usage and the terms you use in your lectures. For example, the text uses the word *resources* whereas you might use *factors of production* in your lecture notes.

6. Some students think that economics is synonymous with business or money. You may wish to explain the difference, because many of your students will be studying business administration.

7. Many students will be apprehensive about the mathematics used in the course. A good way for students to master the few mathematical tools needed in class is by through application and by using the Study Guides and the online materials. It is essential for students to become comfortable with reading and shifting graphs as well as dividing fractions. The appendix to Chapter 1 provides a good foundation for the tools needed.

8. Many beginning students do not understand what economists mean by the statement "consumers are rational." It is helpful to emphasize that rationality does not imply that all consumers must be identical or that all consumers make "good" decisions all the time. Individuals can have dramatically different tastes for goods and service and yet all can be considered rational.

ANSWERS TO QUESTIONS FOR REVIEW

1. (*Definition of Economics*) What determines whether or not a resource is scarce? Why is the concept of scarcity important to the definition of economics?

   A resource is scarce when the amount people desire exceeds the amount available at a price of zero. The concept of scarcity is important to the definition of economics because scarcity forces people to choose how they will use their resources in an attempt to satisfy their unlimited wants and desires. Economics is about making choices. Without scarcity there would be no economic problem, and therefore no need to choose between competing wants and desires.

2. (*Resources*) To which category of resources does each of the following belong?
   a. A taxi
   b. Computer software
   c. One hour of legal counsel
   d. A parking lot
   e. A forest
   f. The Mississippi River
   g. An individual introducing a new way to market products on the Internet.

   a. capital; a manufactured item employed to produce a service.
   b. capital; a manufactured item employed to produce a good.
   c. labor; human effort.
   d. capital and natural resources; the parking lot is on a natural resource (land), but the land has undergone capital improvement in the form of leveling and paving.
   e. natural resource.
   f. natural resource.
   g. entrepreneurial ability.

3. (*Goods and Services*) Explain why each of the following would *not* be considered "free" for the economy as a whole:
   a. Food vouchers
   b. U.S. aid to developing countries
   c. Corporate charitable contributions
   d. Noncable television programs
   e. Public high school education

   a Even if food vouchers allow individuals to "purchase" food at no cost, producing the food in the first place uses resources and hence has a cost.
   b. U.S. aid, while free to the recipient country, involves costs to the United States because the aid requires the use of U.S. resources to assist developing countries.
   c. The corporation (and its owners) pays for these gifts.
   d. This is perhaps the most interesting example. "Free" TV is paid for by consumers through the higher prices of the products advertised there. The cost of advertising is passed along to consumers.
   e. Public high school education is paid for by citizens, either through taxes or borrowing.

4. (*Economic Decision Makers*) Which group of economic decision makers plays the leading role in the economic system? Which groups play supporting roles? In what sense are they supporting actors?

   The main decision makers are households, with firms, governments, and the rest of the world serving as supporting actors. Households are considered to be the lead actors since they supply resources used in production, and demand goods and services produced by other actors. Firms, governments, and the rest of the world are supporting actors because they demand the resources that households supply and use them to produce and supply the goods that households demand.

5. (*Micro versus Macro*) Determine whether each of the following is primarily a microeconomic or a macroeconomic issue:
   a. What price to charge for an automobile
   b. Measuring the impact of tax policies on total consumer spending in the economy
   c. Your family's decisions about what to buy
   d. A worker's decision regarding how much to work each week
   e. Designing a government policy to increase total employment

   Microeconomics is the study of the individual economic behavior of decision-making units in the economy, whereas macroeconomics studies the performance of the economy as a whole.
   a. Microeconomic issue; it refers to the price of an individual good.
   b. Macroeconomic issue; it refers to the economy as a whole.
   c. Microeconomic issue; it refers to the decision of one individual household.
   d. Microeconomic issue; it refers to the decisions of one worker.
   e. Macroeconomic issue; it refers to the economy as a whole.

6. (*Micro versus Macro*) Some economists believe that in order to really understand macroeconomics, you must first understand microeconomics. How does microeconomics relate to macroeconomics?

   Microeconomics studies the behavior and choices made by individuals. The behavior and choices made by these individuals is added together to determine the economy–wide—or macroeconomic—measures, such as total production and unemployment. Microeconomics studies the individual pieces of the economic puzzle; macroeconomics fits those pieces together.

7. (*Normative versus Positive Analysis*) Determine whether each of the following statements is normative or positive:
   a. The U.S. unemployment rate was 6.2 percent in 2014.
   b. The inflation rate in the United States is too high.
   c. The U.S. government should increase the minimum wage.
   d. U.S. trade restrictions cost consumers $100 billion annually.

A positive statement is a statement about what is. It can be supported or rejected by reference to facts. A normative statement concerns what someone thinks ought to be. It is an opinion and can't be shown to be true or false by reference to facts.

a. *Positive. Either the unemployment rate was 6.2 percent or it was not. The validity of the statement can be checked with appropriate data.*
b. *Normative. There is no objective measure of when the inflation rate is high and when it is not. The statement reflects someone's opinion of what rate is too high.*
c. *Normative. The word "should" is usually an indication of an opinion–a normative statement.*
d. *Positive. In principle, the cost of trade restrictions could be measured. Measurement does not involve opinions*

8. (*Role of Theory*) What good is economic theory if it can't predict the behavior of a specific individual?

This question highlights the fact that economics, like all social sciences, attempts to describe and explain human behavior. In doing so, it cannot measure and control for all factors influencing behavior. The result is that the behavior of a specific individual cannot be explained or predicted, but the behavior of groups of individuals can be. We cannot, for example, predict any particular individual's buying response to a sale. We can, however, predict what kind of total selling volume will occur because of a sale.

ANSWERS TO PROBLEMS AND EXERCISES

9. *(Rational Self-Interest*) Discuss the impact of rational self-interest on each of the following decisions:
   a. Whether to attend college full time or enter the workforce full time
   b. Whether to buy a new textbook or a used one
   c. Whether to attend a local college or an out-of-town college

   a. *Individuals will compare the expected benefits of attending college full time with the expected costs. One benefit might be that the individual's stock of knowledge and productivity will grow, and so will his or her wage. Costs include not only tuition, but also the forgone wages, wages that could have been earned by working instead of attending college full time. If the expected benefits outweigh the costs, then the rational person will choose to go to college full time.*
   b. *Individuals will compare the expected benefits of a new textbook with the higher costs of purchasing a new textbook. Benefits include not being confused by other students' markings in the book and a higher resale value. However, the out-of-pocket cost of a new book will be higher than the cost of a used book. If the expected benefits outweigh the costs, then a rational person will purchase the new textbook.*
   c. *Individuals will compare the expected benefits and costs associated with both colleges under consideration and will choose the college at which the difference between benefits and costs is greater. The costs of attending an out-of-town college may include greater travel costs and phone bills and benefits such as learning about a different region.*

10. *(Rational Self-Interest*) If behavior is governed by rational self-interest, why do people make charitable contributions of time and money?

Rational self-interest is not blind materialism, pure selfishness, or greed. Rational self-interest means we choose the option that maximizes expected benefits with a given cost. People will give more to charities when the contribution is tax deductible. The lower the personal cost of helping others the more we are willing to help and contribute.

11. (*Marginal Analysis*) The owner of a small pizzeria is deciding whether to increase the radius of delivery area by one mile. What considerations must be taken into account if such a decision is to increase profitability?

    By increasing its delivery radius, the store will have greater sales. However, these marginal revenues must be balanced against the additional costs incurred, such as greater consumption of pizza ingredients, more gasoline for the delivery truck, and possibly the need to hire additional labor and increase advertising.

12. (*Time and Information*) It is often costly to obtain the information necessary to make good decisions. Yet your own interests can best be served by rationally weighing all options available to you. This requires informed decision making. Does this mean that making uninformed decisions is irrational? How do you determine how much information is the right amount*?*

    Rational decision makers will continue to acquire information as long as the benefit of the additional information exceeds the additional costs. Oftentimes we are willing to pay others to gather and digest the information for us.

13. (*Pitfalls of Economic Analysis*) Review the discussion of pitfalls in economic thinking in this chapter. Then identify the fallacy, or mistake in thinking, in each of the following statements:
    a. Raising taxes always increases government revenues.
    b. Whenever there is a recession, imports decrease. Therefore, to stop a recession, we should increase imports.
    c. Raising the tariff on imported steel helps the U.S. steel industry. Therefore, the entire economy is helped.
    d. Gold sells for about $1,200 per ounce. Therefore, the U.S. government could sell all the gold in Fort Knox at $1,200 per ounce to reduce the national debt.

    a. *This assertion is a mistake because the secondary effects of taxes on production and the labor supply are ignored. If the tax rate were raised to 100 percent, for example, no one would want to work or produce, so government revenues would decline.*
    b. *This is the fallacy that association implies causation. It is more likely that recession causes a change in imports than the other way round.*
    c. *This is a fallacy of composition. True, the tariff may help the steel industry. But it hurts purchasers of steel, including the automobile and construction industries. The overall effect on the economy is unclear.*
    d. *This is the fallacy of composition, because attempts to sell so much gold at once would push down the price of gold.*

14. (*Association Versus Causation*) Suppose I observe that communities with lots of doctors tend to have relatively high rates of illness. I conclude that doctors cause illness. What's wrong with this reasoning?

    You are committing the fallacy that association is causation. The causality is undoubtedly in the other direction; that is, doctors will tend to locate where there is a lot of disease and therefore a greater need for medical care.

15. *(Case Study: College Major and Annual Earnings)* Because some college majors pay nearly twice as much as others, why would students pursuing their rational self-interest choose a lower paying major?

Students select college majors for a variety of reasons, and the expected pay is only one of them. Some students may have a special interest in lower-paying fields, such as philosophy, religion, or social work. Some students may not have the aptitude to succeed in the higher-paying majors, such as engineering, mathematics, or computer science. And many students, when they select a major, may simply be unaware of the pay differences based on college major.

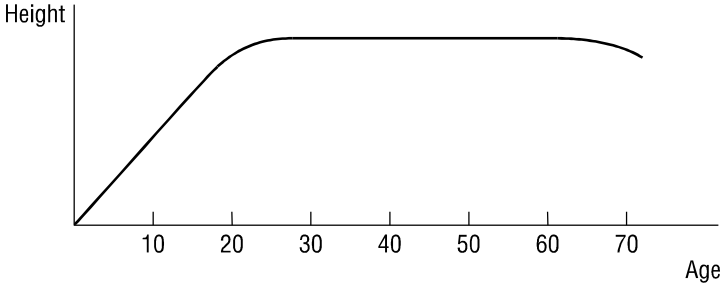
ANSWERS TO APPENDIX QUESTIONS

1. (*Understanding Graphs*) Look at Exhibit 6 and answer the following questions:
   a. In what year (approximately) was the unemployment rate the highest? In what year was it the lowest?
   b. In what decade, on average, was the unemployment rate highest? In what decade was it lowest?
   c. Between 1950 and 1980, did the unemployment rate generally increase, decrease, or remain about the same?

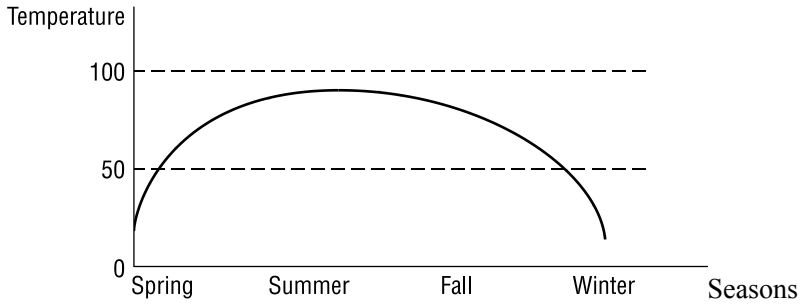
   a. In 1931 the unemployment rate reached its highest point, 25 percent. In 1942 it reached its lowest point, approximately 1 percent.
   b. Unemployment was the highest in the decade of the 1930s and lowest in the decade of the 1900s.
   c. Between 1950 and 1980, unemployment generally increased.

2. *(Drawing Graphs*) Sketch a graph to illustrate your idea of each of the following relationships. Be sure to label each axis appropriately. For each relationship, explain under what circumstances, if any, the curve could shift:
   a. The relationship between a person's age and height
   b. Average monthly temperature in your home town over the course of a year
   c. A person's income and the number of hamburgers consumed per month
   d. The amount of fertilizer added to an acre of land and the amount of corn grown on that land in one growing season
   e. An automobile's horsepower and its gasoline mileage (in miles per gallon*)*

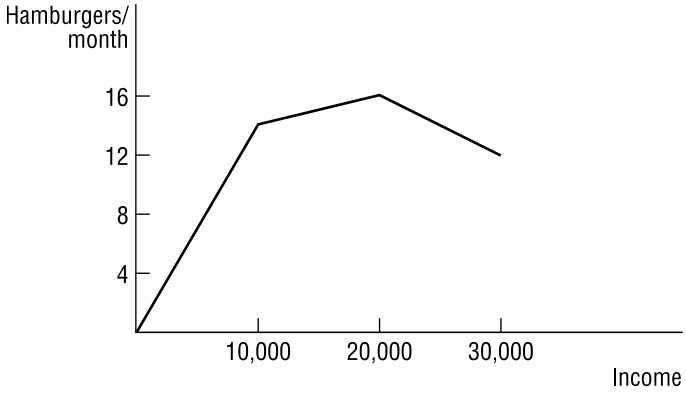
   a. In the years between birth and 15, you would expect a person's height to increase as his or her age increased. After age 15 or so, height would remain constant.



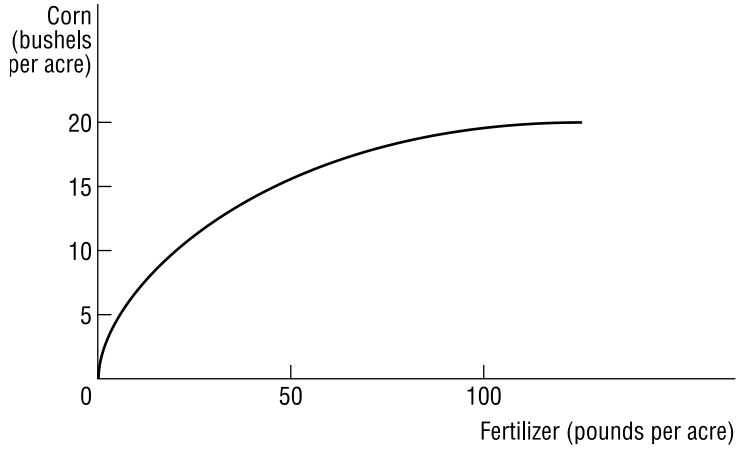
b. *The average monthly temperature in your home town over the course of a year varies with the seasons.*



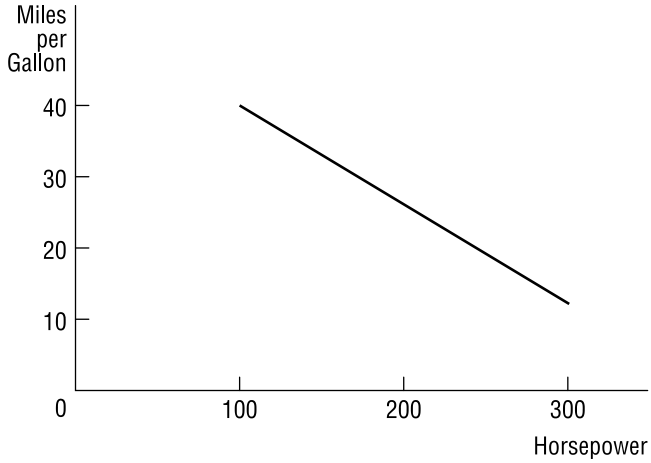
c. *In the following example drawn, the number of hamburgers consumed per month will rise at first as a person's income increases. (The curve is steeply upward sloping from the origin to an income of $10,000). However, after a certain income level, there will be less and less of a rise in the number of hamburgers consumed per month. (The curve is still upward sloping but is flattening between an income of $10,000 and $20,000.) Then, as income rises further, this consumer will decide to try other foods and actually buys fewer hamburgers per month. (The curve begins to slope downward after an income of $20,000 is reached.)*



d. *As you add more fertilizer, you expect to produce more corn per acre up to a point of saturation. An acre of land will have some finite limit on what it can produce in one growing season, no matter how much fertilizer is added!*



e. As a car is engineered to be more powerful with more horsepower, you would expect it to use more gasoline and to get lower mileage per gallon of gasoline.

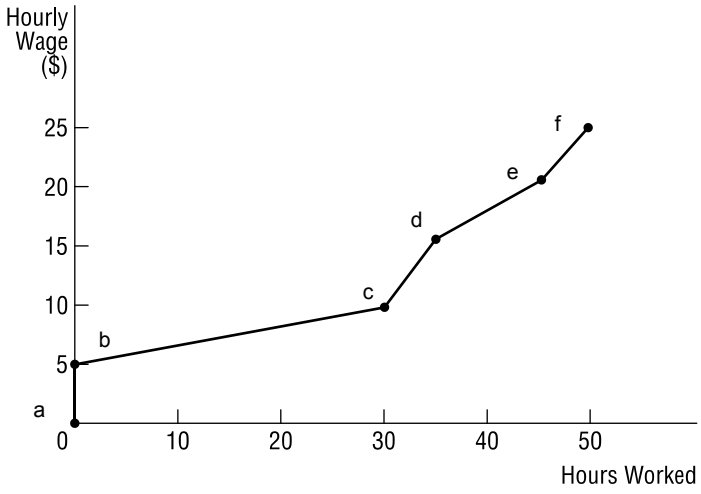


3. (*Slope*) suppose you are given the following data on wage rates and number of hours worked:

Point	Hourly Wage	Hours Worked Per Week
a	$0	0
b	5	0
c	10	30
d	15	35
e	20	45
f	25	50

a. Construct and label a set of axes and plot these six points. Label each point *a, b, c*, and so on. Which variable do you think should be measured on the vertical axis, and which variable should be measured on the horizontal axis?
b. Connect the points. Describe the resulting curve. Does it make sense to you?
c. Compute the slope of the curve between points *a* and *b*. Between points *b* and *c*. Between points *c* and *d*. Between points *d* and *e*. Between points *e* and *f*. What happens to the slope as you move from point *a* to point *f*?

a. It is conventional in economics to measure prices on the vertical axis. Here the wage rate is the price of an hour of labor, so it goes on the vertical axis. Hours worked is measured on the horizontal axis.



b. The graph shows that at very low wage rates, the person chooses not to work at all. It's just not worth her while. However, once the wage reaches $10 per hour, she begins to offer her time in the labor market by being willing to work 30 hours per week. At higher and higher wage rates, she is willing to work more and more hours.

c. The slope is measured by the vertical change that results from a given change along the horizontal axis.

From point a to point b, the vertical change (wage) is 5, and the horizontal change (hours worked) is zero. Slope is 5/0 = assumed infinity.

From point b to point c, the vertical change (wage) is 5, and the horizontal change (hours worked) is 30. Slope is 5/30 = +1/6.

From point c to point d, the vertical change (wage) is 5, and the horizontal change (hours worked) is 5. Slope is 5/5 = +1.

From point d to point e, the vertical change (wage) is 5, and the horizontal change (hours worked) is 10. Slope is 5/10 = +1/2.

From point e to point f, the vertical change (wage) is 5, and the horizontal change (hours worked) is 5. Slope is 5/5 = +1.

A change in the steepness of the curve indicates a change in slope. As the curve becomes steeper, the rate of increase in hours of work (slope) is increasing. The shape of the curve indicates that as the curve flattens, the rate of increase in hours of work (slope) is decreasing.

CASE STUDY

WORLD OF BUSINESS

A Yen for Vending Machines Japan faces a steady drop in the number of working-age people. Here are three reasons why: (1) Japan's birthrate has dropped to a record low; (2) Japan allows little immigration; and (3) Japan's population is aging. As a result, unemployment has usually been lower in Japan than in other countries. For example, Japan's unemployment rate in late 2015 was only 3.4 percent, compared to 5.1 percent in the United States and 11.0 percent in Europe. Because labor is relatively scarce in Japan, it is relatively costly. To sell products, Japanese retailers rely more on physical capital, particularly vending machines, which obviously eliminate the need for sales clerks.

Japan has more vending machines per capita than any other country on the planet—twice as many as the United States and nearly 10 times as many as Europe. And vending machines in Japan sell a wider range of products than elsewhere, including beer, sake, whiskey, rice, fresh eggs, beef, vegetables, pizza, entire meals, fried foods, fresh flowers, clothes, toilet paper, fishing supplies including bait, video games, software, ebooks, toys, DVDs, mobile phone recharging, and even X-rated comic books. Japan's vending machines are also more sophisticated. Newer models come with video monitors and touch-pad screens. Wireless chips alert vendors when supplies run low. Some cigarette and liquor machines have electronic vision that reportedly is better at estimating age than are nightclub bouncers. Sanyo makes a giant machine that sells up to 200 different items at three different temperatures. Some cold-drink dispensers automatically raise prices in hot weather. Thousands of machines allow cell phone users to pay by pressing a few buttons on their phones.

As noted in the chapter, it is common practice in the United States to shake down vending machines that malfunction. Such abuse increases the probability the machines will fail again, leading to a cycle of abuse. Vending machines in Japan are less abused, in part because they are more sophisticated and more reliable and because the Japanese generally have greater respect for private property and, consequently, a lower crime rate (e.g., Japan's theft rate is about half the U.S. rate).

Forty percent of all soft-drink sales in Japan are through vending machines, compared to only 12 percent of U.S. sales. Japanese sales per machine are double the U.S. rate. Research shows that most Japanese consumers prefer an anonymous machine to a salesperson. Despite the abundance of vending machines in Japan, more growth is forecast, spurred on by a shrinking labor pool, technological innovations, and a wide acceptance of machines there. This case study makes two points. First, producers combine resources in a way that conserves, or economizes on, the resource that is more costly—in this case, labor. Second, the customs and conventions of the marketplace can differ across countries, and this variance can result in different types of economic arrangements, such as the more extensive use of vending machines in Japan.

Sources: "Economic and Financial Indicators," *The Economist*, 24 October 2015; Hiroko Tabuchi, "Beef Bowl Economics," *New York Times*, 30 January 2010; and "40 Things You Don't Expect to Find in Vending Machines," at http://www.hongkiat.com/blog/bizarre-vending-machines/. For a photo gallery of vending machines in Japan go to http://www.photomann.com/index.php?dest=machines.

Case Study Discussion Questions: Do vending machines conserve any resources other than labor? Does your answer offer any additional insight into the widespread use of vending machines in Japan? Suppose you had the choice of purchasing identically priced lunches from a vending machine or at a cafeteria. Which would you choose? Why?