2

The Economic Problem: Scarcity and Choice

In the last chapter we provided you with some sense of the questions asked by economists and the broad methods that they use. As you read that chapter, some of you may have been surprised by the range of topics covered by economics. A look at the work done by the economists teaching at your own university will likely reveal a similarly broad range of interests. Some of your faculty will study how Apple and Samsung compete in smartphones. Others will look at discrimination in labor markets. Still others may be exploring the effects of microfinance in India. On the surface, these issues seem quite different from one another. But fundamental to each of these inquiries is the concern with choice in a world of scarcity. Economics explores how individuals make choices in a world of scarce resources and how those individual's choices come together to determine three key features of their society:

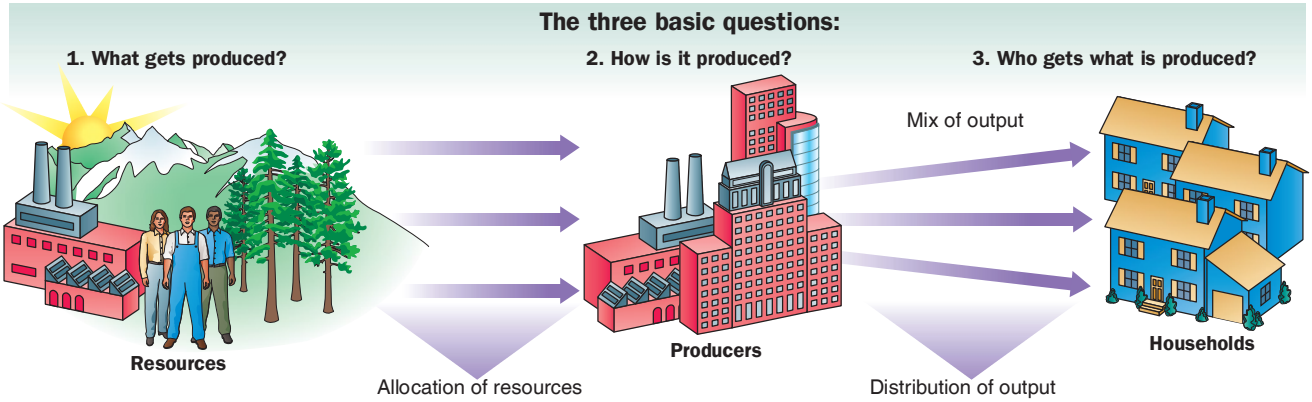
- What gets produced?
- How is it produced?
- Who gets what is produced?

This chapter explores these questions in detail. In a sense, this entire chapter *is* the definition of economics. It lays out the central problems addressed by the discipline and presents a framework that will guide you through the rest of the book. The starting point is the presumption that *human wants are unlimited but resources are not.* Limited or scarce resources force individuals and societies to choose among competing uses of resources—alternative combinations of produced goods and services—and among alternative final distributions of what is produced among households.

These questions are *positive or descriptive.* Understanding how a system functions is important before we can ask the normative questions of whether the system produces good or bad outcomes and how we might make improvements.

Economists study choices in a world of scarce resources. What do we mean by resources? If you look at Figure 2.1, you will see that resources are broadly defined. They include products of nature like minerals and timber, but also the products of past generations like buildings and factories. Perhaps most importantly, resources include the time and talents of the human population.

CHAPTER OUTLINE AND LEARNING OBJECTIVES



▲ **FIGURE 2.1 The Three Basic Questions** MyLab Economics Concept Check

Every society has some system or process that transforms its scarce resources into useful goods and services. In doing so, it must decide what gets produced, how it is produced, and to whom it is distributed. The primary resources that must be allocated are land, labor, and capital.

capital Those goods produced by the economic system that are used as inputs to produce other goods and services in the future.

factors of production (*or* factors) The inputs into the production process. Land, labor, and capital are the three key factors of production.

production The process that transforms scarce resources into useful goods and services.

Things that are produced and then used in the production of other goods and services are called capital resources, or simply **capital**. Buildings, equipment, desks, chairs, software, roads, bridges, and highways are a part of the nation's stock of capital.

The basic resources available to a society are often referred to as **factors of production, *or* simply factors**. The three key factors of production are land, labor, and capital. The process that transforms scarce resources into useful goods and services is called **production**. In many societies, most of the production of goods and services is done by private firms. Private airlines in the United States use land (runways), labor (pilots and mechanics), and capital (airplanes) to produce transportation services. But in all societies, some production is done by the public sector, or government. Examples of government-produced or government-provided goods and services include national defense, public education, police protection, and fire protection.

Resources or factors of production are the **inputs** into the process of production; goods and services of value to households are the **outputs** of the process of production.

2.1 LEARNING OBJECTIVE

Understand why even in a society in which one person is better than a second at all tasks, it is still beneficial for the two to specialize and trade.

Scarcity, Choice, and Opportunity Cost

In the second half of this chapter we discuss the global economic landscape. Before you can understand the different types of economic systems, it is important to master the basic economic concepts of scarcity, choice, and opportunity cost.

Scarcity and Choice in a One-Person Economy MyLab Economics Concept Check

inputs *or* resources Anything provided by nature or previous generations that can be used directly or indirectly to satisfy human wants.

outputs Goods and services of value to households.

The simplest economy is one in which a single person lives alone on an island. Consider Bill, the survivor of a plane crash, who finds himself cast ashore in such a place. Here individual and society are one; there is no distinction between social and private. *Nonetheless, nearly all the same basic decisions that characterize complex economies must also be made in a simple economy.* That is, although Bill will get whatever he produces, he still must decide how to allocate the island's resources, what to produce, and how and when to produce it.

First, Bill must decide *what* he wants to produce. Notice that the word *needs* does not appear here. Needs are absolute requirements; but beyond just enough water, basic nutrition, and shelter to survive, needs are very difficult to define. In any case, Bill must put his wants in some order of priority and make some choices.

Next, he must look at the *possibilities*. What can he do to satisfy his wants given the limits of the island? In every society, no matter how simple or complex, people are constrained in what they can do. In this society of one, Bill is constrained by time, his physical condition, his knowledge, his skills, and the resources and climate of the island.

Given that resources are limited, Bill must decide *how* to best use them to satisfy his hierarchy of wants. Food would probably come close to the top of his list. Should he spend his time gathering fruits and berries? Should he clear a field and plant seeds? The answers to those questions depend on the character of the island, its climate, its flora and fauna (*are* there any fruits and berries?), the extent of his skills and knowledge (does he know anything about farming?), and his preferences (he may be a vegetarian).

Opportunity Cost The concepts of *constrained choice* and *scarcity* are central to the discipline of economics. They can be applied when discussing the behavior of individuals such as Bill and when analyzing the behavior of large groups of people in complex societies.

Given the scarcity of time and resources, if Bill decides to hunt, he will have less time to gather fruits and berries. He faces a trade-off between meat and fruit. There is a trade-off between food and shelter, too. As we noted in Chapter 1, the best alternative that we give up, or forgo, when we make a choice is the **opportunity cost** of that choice.

opportunity cost The best alternative that we forgo, or give up, when we make a choice or a decision

Bill may occasionally decide to rest, to lie on the beach, and to enjoy the sun. In one sense, that benefit is free—he does not have to buy a ticket to lie on the beach. In reality, however, relaxing does have an opportunity cost. The true cost of that leisure is the value of the other things Bill could have otherwise produced, but did not, during the time he spent on the beach.

The trade-offs that are made in this kind of society are vividly and often comically portrayed in the reality television shows that show groups of strangers competing on some deserted island, all trying to choose whether it is better to fish, hunt for berries, build a hut, or build an alliance. Making one of these choices involves giving up an opportunity to do another, and in many episodes we can see the consequences of those choices.

Scarcity and Choice in an Economy of Two or More MyLab Economics Concept Check

Now suppose that another survivor of the crash, Colleen, appears on the island. Now that Bill is not alone, things are more complex and some new decisions must be made. Bill's and Colleen's preferences about what things to produce are likely to be different. They will probably not have the same knowledge or skills. Perhaps Colleen is good at tracking animals and Bill has a knack for building things. How should they split the work that needs to be done? Once things are produced, the two castaways must decide how to divide them. How should their products be distributed?

The mechanism for answering these fundamental questions is clear when Bill is alone on the island. The "central plan" is his; he simply decides what he wants and what to do about it. The minute someone else appears, however, a number of decision-making arrangements immediately become possible. One or the other may take charge, in which case that person will decide for both of them. The two may agree to cooperate, with each having an equal say, and come up with a joint plan; or they may agree to split the planning as well as the production duties. Finally, they may go off to live alone at opposite ends of the island. Even if they live apart, however, they may take advantage of each other's presence by specializing and trading.

Modern industrial societies must answer the same questions that Colleen and Bill must answer, but the mechanics of larger economies are more complex. Instead of two people living together, the United States has more than 300 million people. Still, decisions must be made about what to produce, how to produce it, and who gets it.

Specialization, Exchange, and Comparative Advantage The idea that members of society benefit by specializing in what they do best has a long history and is one of the most important and powerful ideas in all of economics. David Ricardo, a major nineteenth-century British economist, formalized the point precisely. According to Ricardo's **theory of comparative advantage**, specialization and free trade will benefit all trading parties, even when some are "absolutely" more efficient producers than others. Ricardo's basic point applies just as much to Colleen and Bill as it does to different nations.

theory of comparative advantage Ricardo's theory that specialization and free trade will benefit all trading parties, even those that may be "absolutely" more efficient producers.

To keep things simple, suppose that Colleen and Bill have only two tasks to accomplish each week: gathering food to eat and cutting logs to burn. If Colleen could cut more logs than Bill in one day and Bill could gather more nuts and berries than Colleen could, specialization would clearly lead to more total production. Both would benefit if Colleen only cuts logs and Bill only gathers nuts and berries, as long as they can trade.

ECONOMICS IN PRACTICE

Frozen Foods and Opportunity Costs

In 2016, $53 billion of frozen foods were sold in U.S. grocery stores, one quarter of it in the form of frozen dinners and entrées. In the mid-1950s, sales of frozen foods amounted to only $1 billion, a tiny fraction of the overall grocery store sales. One industry observer attributes this growth to the fact that frozen food tastes much better than it did in the past. Can you think of anything else that might be occurring?

The growth of the frozen dinner entrée market in the last 50 years is a good example of the role of opportunity costs in our lives. One of the most significant social changes in the U.S. economy in this period has been the increased participation of women in the labor force. In 1950, only 24 percent of married women worked; by 2013, that fraction had risen to 58 percent. Producing a meal takes two basic ingredients: food and time. When both husbands and wives work, the opportunity cost of time for housework—including making meals—goes up. This tells us that making a home-cooked meal became more expensive in the last 50 years. A natural result is to shift people toward labor-saving ways to make meals. Frozen foods are an obvious solution to the problem of increased opportunity costs.

Another, somewhat more subtle, opportunity cost story is at work encouraging the consumption of frozen foods. In 1960, the first microwave oven was introduced. The spread of this device into America's kitchens was rapid. The microwave turned out to be a quick way to defrost and cook those frozen entrées. So this technology lowered the opportunity cost of making frozen dinners, reinforcing the advantage these meals had over home-cooked meals. Microwaves made cooking with frozen foods cheaper once opportunity cost was considered while home-cooked meals were becoming more expensive.

The entrepreneurs among you also might recognize that the rise we described in the opportunity cost of the home-cooked meal *contributed* in part to the spread of the microwave, creating a reinforcing cycle. In fact, many entrepreneurs find that the simple tools of economics—like the idea of opportunity costs—help them anticipate what products will be

profitable for them to produce in the future. The growth of the two-worker family has stimulated many entrepreneurs to search for labor-saving solutions to family tasks.

The public policy students among you might be interested to know that some researchers attribute part of the growth in obesity in the United States to the lower opportunity costs of making meals associated with the growth of the markets for frozen foods and the microwave. (See David M. Cutler, Edward L. Glaeser, and Jesse M. Shapiro, "Why Have Americans Become More Obese?" *Journal of Economic Perspectives*, Summer 2003: 93–118.)

CRITICAL THINKING

1. Many people think that soda consumption also leads to increased obesity. Many schools have banned the sale of soda in vending machines. Use the idea of opportunity costs to explain why some people think these bans will reduce consumption. Do you agree?

absolute advantage A producer has an absolute advantage over another in the production of a good or service if he or she can produce that product using fewer resources (a lower absolute cost per unit).

Suppose instead that Colleen is better than Bill both at cutting logs *and* gathering food. In particular, whereas Colleen can gather 10 bushels of food per day, Bill can gather only 8 bushels. Further, while Colleen can cut 10 logs per day, Bill can cut only 4 per day. In this sense, we would say Colleen has an **absolute advantage** over Bill in both activities.

Thinking about this situation and focusing just on the productivity levels, you might conclude that it would benefit Colleen to move to the other side of the island and be by herself. Since she is more productive both in cutting logs and gathering food, would she not be better off on her own? How could she benefit by hanging out with Bill and sharing what they produce? One of Ricardo's lasting contributions to economics has been his analysis of exactly this situation. His analysis, which is illustrated in Figure 2.2, shows both how Colleen and Bill should divide the work of the island and how much they will gain from specializing and exchanging even if, as in this example, one party is absolutely better at everything than the other party.

The key to this question is remembering that Colleen's time is limited: this limit creates an opportunity cost. Though Bill is less able at all tasks than Colleen, having him spend time producing

something frees up Colleen's time and this has value. The value from Bill's time depends on his comparative advantage. A producer has a **comparative advantage** over another in the production of a good or service if he or she can produce the good or service at a lower opportunity cost. First, think about Bill. He can produce 8 bushels of food per day, or he can cut 4 logs. To get 8 additional bushels of food, he must give up cutting 4 logs. Thus, *for Bill, the opportunity cost of 8 bushels of food is 4 logs.* Think next about Colleen. She can produce 10 bushels of food per day, or she can cut 10 logs. She thus gives up 1 log for each additional bushel; so *for Colleen, the opportunity cost of 8 bushels of food is 8 logs.* Bill has a comparative advantage over Colleen in the production of food because he gives up only 4 logs for an additional 8 bushels, whereas Colleen gives up 8 logs.

comparative advantage The advantage in the production of a good enjoyed by one country over another when that good can be produced at lower cost (in terms of other goods that must be foregone) than it could be in the other country..

Think now about what Colleen must give up in terms of food to get 10 logs. To produce 10 logs she must work a whole day. If she spends a day cutting 10 logs, she gives up a day of gathering 10 bushels of food. Thus, *for Colleen, the opportunity cost of 10 logs is 10 bushels of food.* What must Bill give up to get 10 logs? To produce 4 logs, he must work 1 day. For each day he cuts logs, he gives up 8 bushels of food. He thus gives up 2 bushels of food for each log; so *for Bill, the opportunity cost of 10 logs is 20 bushels of food.* Colleen has a comparative advantage over Bill in the production of logs because she gives up only 10 bushels of food for an additional 10 logs, whereas Bill gives up 20 bushels.

Ricardo argued that two parties can benefit from specialization and trade even if one party has an absolute advantage in the production of both goods if each party takes advantage of his or her comparative advantage. Let us see how this works in the current example.

Suppose Colleen and Bill both want equal numbers of logs and bushels of food. If Colleen goes off on her own and splits her time equally, in one day she can produce 5 logs and 5 bushels of food. Bill, to produce equal amounts of logs and food, will have to spend more time on the wood than the food, given his talents. By spending one-third of his day producing food and two-thirds chopping wood, he can produce $2\frac{2}{3}$ *units* of each. In sum, when acting alone, $7\frac{2}{3}$ logs and bushels of food are produced by our pair of castaways, most of them by Colleen. Clearly Colleen is a better producer than Bill. Why should she ever want to join forces with clumsy, slow Bill?

The answer lies in the gains from specialization, as we can see in Figure 2.2. In block a, we show the results of having Bill and Colleen each working alone chopping logs and gathering food: $7\frac{2}{3}$ logs and an equal number of food bushels. Now, recalling our calculations indicating that Colleen has a comparative advantage in wood chopping, let's see what happens if we assign Colleen to the wood task and have Bill spend all day gathering food. This system is described in block b of Figure 2.2. At the end of the day, the two end up with 10 logs, all gathered by Colleen and 8 bushels of food, all produced by Bill. By joining forces and specializing, the two have increased their production of both goods. This increased production provides an incentive for Colleen and Bill to work together. United, each can receive a bonus over what he or she could produce separately. This bonus—here $2\frac{1}{3}$ extra logs and $\frac{1}{3}$ bushel of food—represent the gains from specialization. Of course if both Bill and Colleen really favor equal amounts of the two goods, they could adjust their work time to get to this outcome; the main point here is that the total production increases with some specialization.

The simple example of Bill and Colleen should begin to give you some insight into why most economists see value in free trade. Even if one country is absolutely better than another country at producing everything, our example has shown that there are gains to specializing and trading.

A Graphical Presentation of the Production Possibilities and Gains from Specialization

Graphs can also be used to illustrate the production possibilities open to Colleen and Bill and the gains they could achieve from specialization and trade.

Figure 2.3(a) shows all of the possible combinations of food and wood Colleen can produce given her skills and the conditions on the island, acting alone. Panel (b) does the same for Bill. If Colleen spends all of her time producing wood, the best she can do is 10 logs, which we show where the line crosses the vertical axis. Similarly, the line crosses the horizontal axis at 10 bushels of food, because that is what Colleen could produce spending full time producing food. We have also marked on the graph possibility C, where she divides her time equally, generating 5 bushels of food and 5 logs of wood.

In panel (b), Bill can get as many as 4 logs of wood or 8 bushels of food by devoting himself full time to either wood or food production. Again, we have marked on his graph a point F, where he produces $2\frac{2}{3}$ bushels of food and $2\frac{2}{3}$ logs of wood. Notice that Bill's production line is lower down than is Colleen's. The further to the right is the production line, the more productive

▸ FIGURE 2.2
Comparative Advantage and the Gains from Trade
Panel (a) shows the best Colleen and Bill can do each day, given their talents and assuming they each wish to consume an equal amount of food and wood. Notice Colleen produces by splitting her time equally during the day, while Bill must devote two-thirds of his time to wood production if he wishes to equalize his amount produced of the two goods. Panel (b) shows what happens when both parties specialize. Notice more units are produced of each good.

a. Daily production with no specialization, assuming Colleen and Bill each want to consume an equal number of logs and food

	Wood (logs)	Food (bushels)
Colleen	5	5
Bill	$2\frac{2}{3}$	$2\frac{2}{3}$
Total	$7\frac{2}{3}$	$7\frac{2}{3}$

b. Daily Production with Specialization

	Wood (logs)	Food (bushels)
Colleen	10	0
Bill	0	8
Total	10	8

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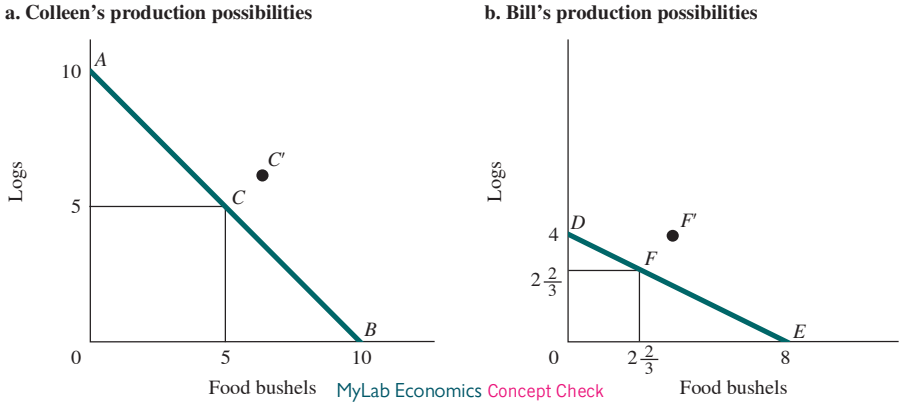
is the individual; that is, the more he or she can produce of the two goods. Also notice that the slope of the two lines is not the same. Colleen trades off one bushel of food for one log of wood, while Bill gives up 2 bushels of food for one log of wood. These differing slopes show the differing opportunity costs faced by Colleen and Bill. They also open up the possibility of gains from specialization. Try working through an example in which the slopes are the same to convince yourself of the importance of differing slopes.

What happens when the possibility of working together and specializing in either wood or food comes up? In Figure 2.2 we have already seen that specialization would allow the pair to go from production of $7\frac{2}{3}$ *units* of food and wood to 10 logs and 8 bushels of food. Colleen and Bill can split the $2\frac{1}{3}$ extra logs and the $\frac{1}{3}$ extra bushel of food to move to points like C' and F' in Figure 2.3, which were unachievable without cooperation. In this analysis we do not know how



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▲ FIGURE 2.3 **Production Possibilities with and without Trade**
This figure shows the combinations of food and wood that Colleen and Bill can each generate in one day of labor, working by themselves. Colleen can achieve independently any point along line ACB, whereas Bill can generate any combination of food and wood along line DFE. Specialization and trade would allow both Bill and Colleen to move to the right of their original lines, to points like C' and F'. In other words, specialization and trade allow both people to be better off than if they were acting alone.

Bill and Colleen will divide the surplus food and wood they have created. But because there is a surplus, both of them can do better than either would alone.

Weighing Present and Expected Future Costs and Benefits Very often we find ourselves weighing benefits available today against benefits available tomorrow. Here, too, the notion of opportunity cost is helpful.

While alone on the island, Bill had to choose between cultivating a field and just gathering wild nuts and berries. Gathering nuts and berries provides food now; gathering seeds and clearing a field for planting will yield food tomorrow if all goes well. Using today's time to farm may well be worth the effort if doing so will yield more food than Bill would otherwise have in the future. By planting, Bill is trading present value for future value.

The simplest example of trading present for future benefits is the act of saving. When you put income aside today for use in the future, you give up some things that you could have had today in exchange for something tomorrow. Because nothing is certain, some judgment about future events and expected values must be made. What will your income be in 10 years? How long are you likely to live?

We trade off present and future benefits in small ways all the time. If you decide to study instead of going to the dorm party, you are trading present fun for the expected future benefits of higher grades. If you decide to go outside on a very cold day and run 5 miles, you are trading discomfort in the present for being in better shape later.

Capital Goods and Consumer Goods A society trades present for expected future benefits when it devotes a portion of its resources to research and development or to investment in capital. As we said previously in this chapter, *capital* in its broadest definition is anything that has already been produced that will be used to produce other valuable goods or services over time.

Building capital means trading present benefits for future ones. Bill and Colleen might trade gathering berries or lying in the sun for cutting logs to build a nicer house in the future. In a modern society, resources used to produce capital goods could have been used to produce **consumer goods**—that is, goods for present consumption. Heavy industrial machinery does not directly satisfy the wants of anyone, but producing it requires resources that could instead have gone into producing things that do satisfy wants directly—for example, food, clothing, toys, or golf clubs.

consumer goods Goods produced for present consumption.

Capital is everywhere. A road is capital. Once a road is built, we can drive on it or transport goods and services over it for many years to come. A house is also capital. Before a new manufacturing firm can start up, it must put some capital in place. The buildings, equipment, and inventories that it uses comprise its capital. As it contributes to the production process, this capital yields valuable services over time.

Capital does not need to be tangible. When you spend time and resources developing skills or getting an education, you are investing in human capital—your own human capital. This capital will continue to exist and yield benefits to you for years to come. A new app produced by a software company and available online may cost nothing to distribute, but its true intangible value comes from the ideas embodied in the program itself. It too is capital.

The process of using resources to produce new capital is called **investment**. (In everyday language, the term *investment* often refers to the act of buying a share of stock or a bond, as in "I invested in some Treasury bonds." In economics, however, investment *always* refers to the creation of capital: the purchase or putting in place of buildings, equipment, roads, houses, and the like.) A wise investment in capital is one that yields future benefits that are more valuable than the present cost. When you spend money for a house, for example, presumably you value its future benefits. That is, you expect to gain more in shelter services than you would from the things you could buy today with the same money. Because resources are scarce, the opportunity cost of every investment in capital is forgone present consumption.

investment New capital additions to a firm's capital stock. Although capital is measured at a given point in time (a stock), investment is measured over a period of time (a flow). The flow of investment increases the capital stock.

The Production Possibility Frontier MyLab Economics Concept Check

A simple graphic device called the **production possibility frontier (ppf)** illustrates the principles of constrained choice, opportunity cost, and scarcity. The ppf is a graph that shows all the combinations of goods and services that can be produced if all of a society's resources are used

production possibility frontier (ppf) A graph that shows all the combinations of goods and services that can be produced if all of society's resources are used efficiently.

efficiently. Figure 2.4 shows a ppf for a hypothetical economy. We have already seen a simplified version of a ppf in looking at the choices of Colleen and Bill in Figure 2.3. Here we will look more generally at the ppf.

On the *Y*-axis, we measure the quantity of capital goods produced. On the *X*-axis, we measure the quantity of consumer goods. All points below and to the left of the curve (the shaded area) represent combinations of capital and consumer goods that are possible for the society given the resources available and existing technology. Points above and to the right of the curve, such as point *G*, represent combinations that cannot currently be realized. You will recall in our example of Colleen and Bill that new trade and specialization possibilities allowed them to expand their collective production possibilities and move to a point like *G*. If an economy were to end up at point *A* on the graph, it would be producing no consumer goods at all; all resources would be used for the production of capital. If an economy were to end up at point *B*, it would be devoting all its resources to the production of consumer goods and none of its resources to the formation of capital.

While all economies produce some of each kind of good, different countries emphasize different things. About 16 percent of gross output in the United States in 2017 was new capital. In Japan, capital has historically accounted for a much higher percent of gross output, while in the Congo, the figure is about 7 percent. Japan is closer to point *A* on its ppf, the Congo is closer to *B*, and the United States is somewhere in between.

Points that are actually on the ppf are points of both full resource employment and production efficiency. (Recall from Chapter 1 that an efficient economy is one that produces the things that people want at the least cost. *Production efficiency* occurs when a given mix of outputs is produced at the least cost.) Resources are not going unused, and there is no waste. Points that lie within the shaded area but that are not on the frontier represent either unemployment of resources or production inefficiency. An economy producing at point *D* in Figure 2.4 can produce more capital goods and more consumer goods, for example, by moving to point *E*. Resources are not fully employed at point *D* or are not being used efficiently. During the Great Depression of the 1930s, the U.S. economy experienced prolonged unemployment. Millions of workers found themselves without jobs. In 1933, 25 percent of the civilian labor force was unemployed. More recently, between the end of 2007 and 2010, the United States lost more than 8 million payroll jobs and unemployment rose to higher than 15 million. During both of these periods, the economy was at a point like D in Figure 2.4, producing less than it could have. Mismanagement by private firms or the government can also leave an economy underperforming, operating inside the ppf.

Negative Slope and Opportunity Cost The slope of the ppf is negative, reflecting the fact that a society's choices are constrained by available resources and existing technology. When

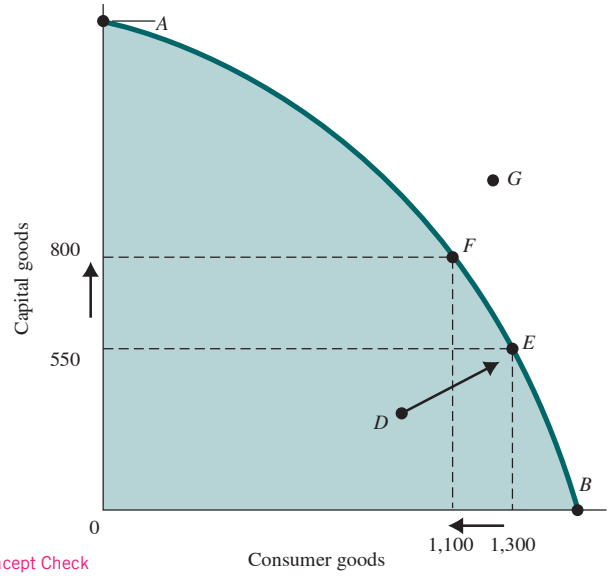

FIGURE 2.4
Production Possibility Frontier
The ppf illustrates a number of economic concepts. One of the most important is *opportunity cost*. The opportunity cost of producing more capital goods is fewer consumer goods. Moving from *E* to *F*, the number of capital goods increases from 550 to 800, but the number of consumer goods decreases from 1,300 to 1,100.

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those resources are fully and efficiently employed, society can produce more capital goods only by reducing production of consumer goods. The opportunity cost of the additional capital is the forgone production of consumer goods.

The fact that scarcity exists is illustrated by the negative slope of the ppf. (If you need a review of slope, see the Appendix to Chapter 1.) In moving from point *E* to point *F* in Figure 2.4, capital production *increases* by 800 − 550 = 250 units (a positive change), but that increase in capital can be achieved only by shifting resources out of the production of consumer goods. Thus, in moving from point *E* to point *F* in Figure 2.4, consumer goods production *decreases* by 1,300 − 1,100 = 200 units (a negative change). The slope of the curve, the ratio of the change in capital goods to the change in consumer goods, is negative.

The value of the slope of a society's ppf is called the **marginal rate of transformation (MRT)**. In Figure 2.4, the MRT between points *E* and *F* is simply the ratio of the change in capital goods (a positive number) to the change in consumer goods (a negative number). It tells us how much society has to give up of one output to get a unit of a second.

marginal rate of transformation (MRT) The slope of the production possibility frontier (ppf).

The Law of Increasing Opportunity Cost The negative slope of the ppf indicates the trade-off that a society faces between two goods. In the example of Colleen and Bill, we showed the ppf as a straight line. What does it mean that the ppf here is bowed out?

In our simple example, Bill gave up two bushels of food for every one log of wood he produced. Bill's per-hour ability to harvest wood or produce food didn't depend on how many hours he spent on that activity. Similarly, Colleen faced the same trade off of food for wood regardless of how much of either she was producing. In the language we have just introduced, the marginal rate of transformation was constant for Bill and Colleen; hence the straight line ppf. But that is not always true. Perhaps the first bushel of food is easy to produce, low-hanging fruit for example. Perhaps it is harder to get the second log than the first because the trees are farther away. The bowed out ppf tells us that the more society tries to increase production of one good rather than another, the harder it is. In the example in Figure 2.4, the opportunity cost of using society's resources to make capital goods rather than consumer goods increases as we devote more and more resources to capital goods. Why might that be? A common explanation is that when society tries to produce only a small amount of a product, it can use resources—people, land and so on—most well-suited to those goods. As a society spends a larger portion of its resources on one good versus all others, getting more production of that good often becomes increasingly hard.

Let's look at the trade-off between corn and wheat production in Ohio and Kansas as an example. In a recent year, Ohio and Kansas together produced 510 million bushels of corn and 380 million bushels of wheat. Table 2.1 presents these two numbers, plus some hypothetical combinations of corn and wheat production that might exist for Ohio and Kansas together. Figure 2.5 graphs the data from Table 2.1.

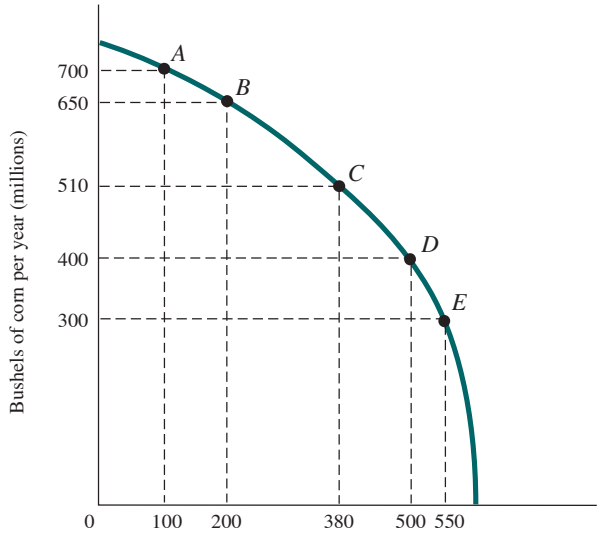

FIGURE 2.5 Corn and Wheat Production in Ohio and Kansas
The ppf illustrates that the opportunity cost of corn production increases as we shift resources from wheat production to corn production. Moving from point *E* to *D*, we get an additional 100 million bushels of corn at a cost of 50 million bushels of wheat. Moving from point *B* to *A*, we get only 50 million bushels of corn at a cost of 100 million bushels of wheat. The *cost per bushel* of corn—measured in lost wheat—has increased.

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TABLE 2.1 Production Possibility Schedule for Total Corn and Wheat Production in Ohio and Kansas

Point on ppf	Total Corn Production (Millions of Bushels per Year)	Total Wheat Production (Millions of Bushels per Year)
A	700	100
B	650	200
C	510	380
D	400	500
E	300	550

Suppose society's demand for corn dramatically increases. If this happens, farmers would probably shift some of their acreage from wheat production to corn production. Such a shift is represented by a move from point *C* (where corn = 510 and wheat = 380) up and to the left along the ppf toward points *A* and *B* in Figure 2.5. As this happens, it becomes more difficult to produce additional corn. The best land for corn production was presumably already in corn, and the best land for wheat production was already in wheat. As we try to produce more corn, the land is less well-suited to that crop. As we take more land out of wheat production, we are taking increasingly better wheat-producing land. In other words, the opportunity cost of more corn, measured in terms of wheat foregone, increases.

Moving from point *E* to *D*, Table 2.1 shows that we can get 100 million bushels of corn (400–300) by sacrificing only 50 million bushels of wheat (550–500)—that is, we get 2 bushels of corn for every bushel of wheat. However, when we are already stretching the ability of the land to produce corn, it becomes harder to produce more and the opportunity cost increases. Moving from point *B* to *A*, we can get only 50 million bushels of corn (700–650) by sacrificing 100 million bushels of wheat (200–100). For every bushel of wheat given up, we now get only half a bushel of corn. Conversely, if the demand for *wheat* were to increase substantially and we moved down and to the right along the ppf, it would become increasingly difficult to produce wheat and the opportunity cost of wheat, in terms of corn foregone, would increase. This is the *law of increasing opportunity cost*.

The Efficient Mix of Output

To be efficient, an economy must produce what people want. This means that in addition to operating *on* the ppf, the economy must be operating at the *right point* on the ppf. This is referred to as *output efficiency*, in contrast to production efficiency. Suppose an economy devotes 100 percent of its resources to beef production and the beef industry runs efficiently using the most modern techniques. If everyone in the society were a vegetarian and there were no trade, resources spent on producing beef would be wasted.

It is important to remember that the ppf represents choices available within the constraints imposed by the current state of agricultural technology. In the long run, technology may improve, and when that happens, we have *growth*.

economic growth An increase in the total output of an economy. Growth occurs when a society acquires new resources or when it learns to produce more using existing resources.

Economic Growth

Economic growth is characterized by an increase in the total output of an economy. It occurs when a society acquires new resources or learns to produce more with existing resources. New resources may mean a larger labor force or an increased capital stock. The production and use of new machinery and equipment (capital) increase workers' productivity. (Give a man a shovel, and he can dig a bigger hole; give him a steam shovel, and wow!) Improved productivity also comes from technological change and *innovation*, the discovery and application of new, more efficient production techniques.

In the past few decades, the productivity of U.S. agriculture has increased dramatically. Based on data compiled by the Department of Agriculture, Table 2.2 shows that yield per acre in corn production has increased sixfold since the late 1930s, and the labor required to produce it has dropped significantly. Productivity in wheat production has also increased, at only a slightly less remarkable rate: Output per acre has more than tripled, whereas labor requirements are down nearly 90 percent. These increases are the result of more efficient farming techniques,

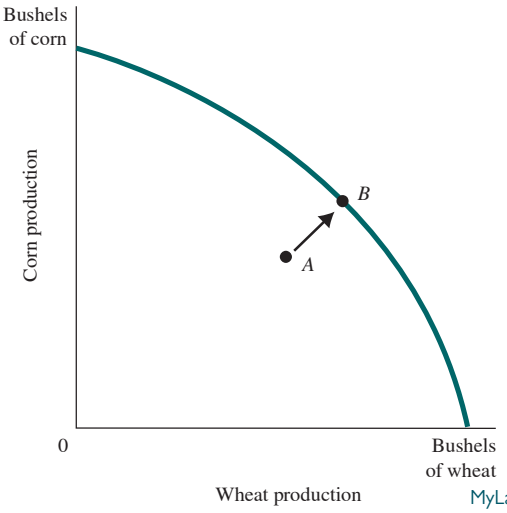

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FIGURE 2.6
Inefficiency from Misallocation of Land in Farming
Inefficiency always results in a combination of production shown by a point inside the ppf, like point *A*. Increasing efficiency will move production possibilities toward a point on the ppf, such as point *B*.

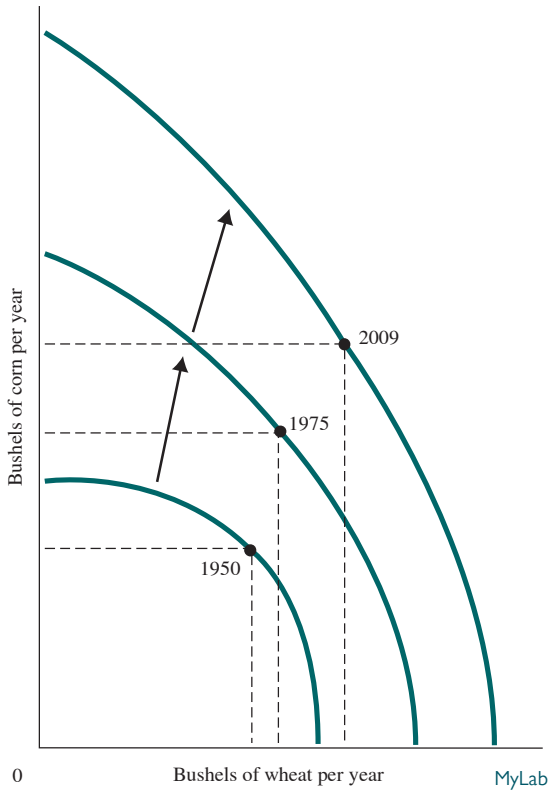
more and better capital (tractors, combines, and other equipment), and advances in scientific knowledge and technological change (hybrid seeds, fertilizers, and so on). As you can see in Figure 2.7, changes such as these shift the ppf up and to the right.

Sources of Growth and the Dilemma of Poor Countries Economic growth arises from many sources. The two most important over the years have been the accumulation of capital and technological advances. For poor countries, capital is essential; they must build the

TABLE 2.2 Increasing Productivity in Corn and Wheat Production in the United States, 1935–2017

	Corn	Wheat
	Yield per Acre (Bushels)	Yield per Acre (Bushels)
1935–1939	26.1	13.2
1945–1949	36.1	16.9
1955–1959	48.7	22.3
1965–1969	78.5	27.5
1975–1979	95.3	31.3
1981–1985	107.2	36.9
1985–1990	112.8	38.0
1990–1995	120.6	38.1
1998	134.4	43.2
2001	138.2	43.5
2006	145.6	42.3
2007	152.8	40.6
2008	153.9	44.9
2009	164.9	44.3
2010	152.8	46.4
2011	147.2	43.7
2012	123.4	46.3
2013	158.8	47.2
2014	171.0	43.7
2015	168.4	43.6
2016	174.6	52.7
2017	176.6	46.3

Source: U.S. Department of Agriculture, Economic Research Service, Agricultural Statistics, Crop Summary.



▸ FIGURE 2.7 Economic Growth Shifts the PPF Up and to the Right
Productivity increases have enhanced the ability of the United States to produce both corn and wheat. As Table 2.2 shows, productivity increases were more dramatic for corn than for wheat. Thus, the shifts in the ppf were not parallel.

MyLab Economics Concept Check

communication networks and transportation systems necessary to develop industries that function efficiently. They also need capital goods to develop their agricultural sectors.

Recall that capital goods are produced only at a sacrifice of consumer goods. Technical advances similarly require a present sacrifice in order to fund the research required for such advances.

When a large part of a country's population is poor, taking resources out of the production of consumer goods (such as food and clothing) is difficult. In addition, in some countries, people wealthy enough to invest in domestic industries choose instead to invest abroad because of political turmoil at home. As a result, it often falls to the governments of poor countries to generate revenues for capital production and research out of tax collections.

All these factors have contributed to the growing gap between some poor and rich nations. Figure 2.8 shows the result using ppfs. On the bottom left, the rich country devotes a larger portion of its production to capital, whereas the poor country on the top left produces mostly consumer goods. On the right, you see the results: The ppf of the rich country shifts up and out further and faster.

The importance of capital goods and technological developments to the position of workers in less-developed countries is well illustrated by Robert Jensen's study of South India's industry. Conventional telephones require huge investments in wires and towers and, as a result, many less developed areas are without landlines. Mobile phones, on the other hand, require a lower investment; thus, in many areas, people upgraded from no phones directly to cell phones. Jensen found that in small fishing villages, the advent of cell phones allowed fishermen to determine on any given day where to take their catch to sell, resulting in a large decrease in fish wasted and an increase in fishing profits. The ability of newer communication technology to aid development is one of the exciting features of our times.[1]

Although it exists only as an abstraction, the ppf illustrates a number of important concepts that we will use throughout the rest of this book: scarcity, unemployment,

[1] See Robert Jensen, "The Digital Provide: Information Technology, Market Performance, and Welfare in the South Indian Fisheries Sector," *Quarterly Journal of Economics,* 2007: 879–924.

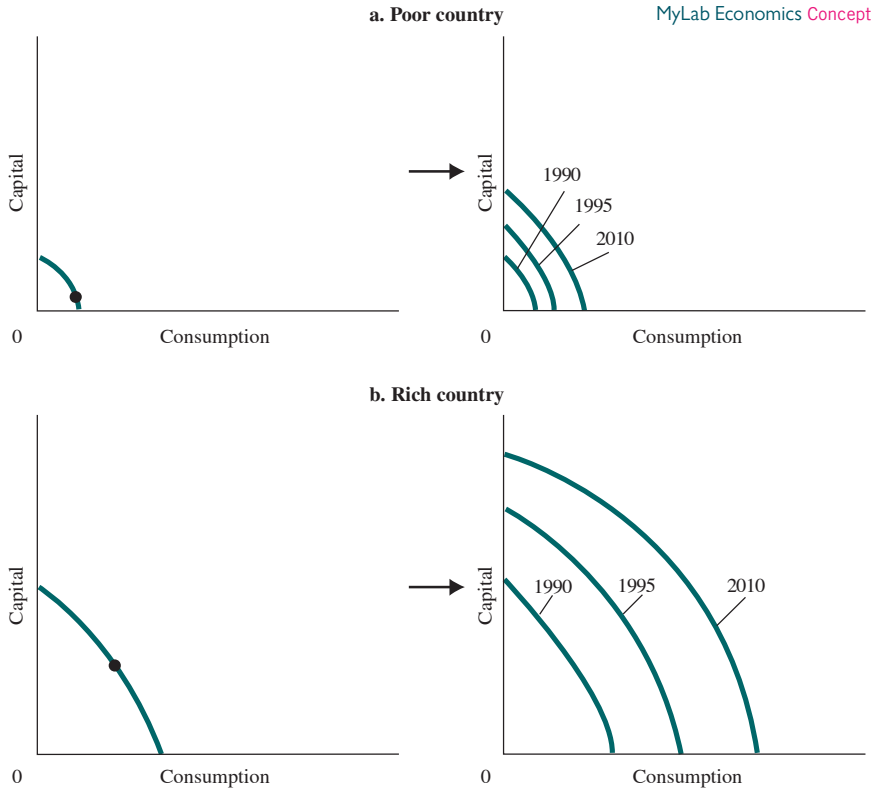


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FIGURE 2.8 Capital Goods and Growth in Poor and Rich Countries
Rich countries find it easier than poor countries to devote resources to the production of capital, and the more resources that flow into capital production, the faster the rate of economic growth. Thus, the gap between poor and rich countries has grown over time.

inefficiency, opportunity cost, the law of increasing opportunity cost, economic growth, and the gains from trade.

The Economic Problem MyLab Economics Concept Check

Recall the three basic questions facing all economic systems: (1) What gets produced? (2) How is it produced? and (3) Who gets it?

When Bill was alone on the island, the mechanism for answering those questions was simple: He thought about his own wants and preferences, looked at the constraints imposed by the resources of the island and his own skills and time, and made his decisions. As Bill set about his work, he allocated available resources quite simply, more or less by dividing up his available time. Distribution of the output was irrelevant. Because Bill was the society, he got it all.

Introducing even one more person into the economy—in this case, Colleen—changed all that. Cooperation and coordination may give rise to gains that would otherwise not be possible. When a society consists of millions of people, coordination and cooperation become more challenging, but the potential for gain also grows. In large, complex economies, specialization can grow dramatically. The range of products available in a modern industrial society is beyond anything that could have been imagined a hundred years ago, and so is the range of jobs. Specialization plays a role in this.

The amount of coordination and cooperation in a modern industrial society is almost impossible to imagine. Yet something seems to drive economic systems, if sometimes clumsily and inefficiently, toward producing the goods and services that people want. Given scarce resources, how do large, complex societies go about answering the three basic economic questions? This is the economic problem, which is what this text is about.

ECONOMICS IN PRACTICE

Changing Consumption Patterns in China

In all societies, for all people, resources are limited relative to people's demands. Scarcity of resources is the primary reason we face trade-offs. However, as an economy grows, more resources become available and the trade-offs it faces change.

China is the world's second largest economy, and it has been driving global growth for a decade. At the turn of the century, the average Chinese household spent around one third of its income on food. Since 2015, this proportion has declined to roughly 28 percent as the Chinese are increasingly moving toward the consumption of non-food products. At the same time, the proportion of expenditure on housing in consumer income rose from 13.2 percent to 15.4 percent, health care spending from 10 percent to 11.3 percent, and communications and transport from 10.4 percent to almost 12 percent.[1]

You can see that as an economy grows and consumer income increases, food becomes a smaller component of the budget. The change in the pattern of consumption has also had its mark on prices. As the Chinese economy is utilizing more inputs, the cost of each unit of output is becoming more expensive. In 2017, food inflation was much lower than non-food inflation, primarily due to the increase in expenditure on healthcare, communications, clothing, education, and entertainment. This also includes expenditure on additional commodities such as financial services and pets as domestic and foreign firms try to capitalize on the changes in the consumption patterns of the largest consumer market in the world.

CRITICAL THINKING

1. How does the change in the pattern of consumption expenditure in China relate to the law of increasing opportunity cost?

[1] China National Bureau of Statistics, *China Statistical Yearbook* – 2016. Beijing: China Statistics Press.

2.2 LEARNING OBJECTIVE

Understand the central difference in the way command economies and market economies decide what is produced.

Economic Systems and the Role of Government

Thus far we have described the questions that the economic system must answer. Now we turn to the mechanics of the system. What is the role played by government in deciding what and how things are produced? There are many circumstances in which the government may be able to improve the functioning of the market.

Command Economies MyLab Economics Concept Check

command economy An economy in which a central government either directly or indirectly sets output targets, incomes, and prices.

In a pure **command economy**, like the system in place in the Soviet Union or China some years ago, the basic economic questions are answered by a central government. Through a combination of government ownership of state enterprises and central planning, the government, either directly or indirectly, sets output targets, incomes, and prices.

At present, for most countries in the world, private enterprise plays at least some role in production decisions. The debate today is instead about the extent and the character of government's role in the economy. Government involvement, in theory, may improve the efficiency and fairness of the allocation of a nation's resources. At the same time, a poorly functioning

government can destroy incentives, lead to corruption, and result in the waste of a society's resources.

Laissez-Faire Economies: The Free Market MyLab Economics Concept Check

At the opposite end of the spectrum from the command economy is the **laissez-faire economy**. The term *laissez-faire*, which translated literally from French means "allow [them] to do," implies a complete lack of government involvement in the economy. In this type of economy, individuals and firms pursue their own self-interest without any central direction or regulation; the sum total of millions of individual decisions ultimately determines all basic economic outcomes. The central institution through which a laissez-faire system answers the basic questions is the **market**, a term that is used in economics to mean an institution through which buyers and sellers interact and engage in exchange.

laissez-faire economy Literally from the French: "allow [them] to do." An economy in which individual people and firms pursue their own self-interest without any government direction or regulation.

market The institution through which buyers and sellers interact and engage in exchange.

In short:

> Some markets are simple and others are complex, but they all involve buyers and sellers engaging in exchange. The behavior of buyers and sellers in a laissez-faire economy determines what gets produced, how it is produced, and who gets it.

The following chapters explore market systems in great depth. A quick preview is worthwhile here, however.

Consumer Sovereignty In a free, unregulated market, goods and services are produced and sold only if the supplier can make a profit. In simple terms, making a *profit* means selling goods or services for more than it costs to produce them. You cannot make a profit unless someone wants the product that you are selling. The mix of output found in any free market system is dictated ultimately by the tastes and preferences of consumers who "vote" by buying or not buying. Economists call this **consumer sovereignty**. Businesses rise and fall in response to consumer demands. No central directive or plan is necessary.

consumer sovereignty The idea that consumers ultimately dictate what will be produced (or not produced) by choosing what to purchase (and what not to purchase).

Individual Production Decisions: Free Enterprise Under a free market system, individual producers must also determine how to organize and coordinate the actual production of their products or services. In a free market economy, producers may be small or large. One person who is good with computers may start a business designing Web sites. On a larger scale, a group of furniture designers may put together a large portfolio of sketches, raise several million dollars, and start a bigger business. At the extreme are huge corporations such as Microsoft, Mitsubishi, Apple, and Intel, each of which sells tens of billions of dollars' worth of products every year. Whether the firms are large or small, however, production decisions in a market economy are made by separate private organizations acting in what they perceive to be their own interests.

Proponents of free market systems argue that the use of markets leads to more efficient production and better response to diverse and changing consumer preferences. If a producer is inefficient, competitors will come along, fight for the business, and eventually take it away. Thus, in a free market economy, competition forces producers to use efficient techniques of production and to produce goods that consumers want.

Distribution of Output In a free market system, the distribution of output—who gets what—is also determined in a decentralized way. To the extent that income comes from working for a wage, it is at least in part determined by individual choice. You will work for the wages available in the market only if these wages (and the products and services they can buy) are sufficient to compensate you for what you give up by working. You may discover that you can increase your income by getting more education or training.

Price Theory The basic coordinating mechanism in a free market system is price. A price is the amount that a product sells for per unit, and it reflects what society is willing to pay. Prices of inputs—labor, land, and capital—determine how much it costs to produce a product. Prices of various kinds of labor, or *wage rates*, determine the rewards for working in different jobs and professions. Many of the independent decisions made in a market economy involve the weighing of prices and costs, so it is not surprising that much of economic theory focuses on the factors that influence and determine prices. This is why microeconomic theory is often simply called *price theory*.

In sum:

In a free market system, the basic economic questions are answered without the help of a central government plan or directives. This is what the "free" in free market means—the system is left to operate on its own with no outside interference. Individuals pursuing their own self-interest will go into business and produce the products and services that people want. Other individuals will decide whether to acquire skills; whether to work; and whether to buy, sell, invest, or save the income that they earn. The basic coordinating mechanism is price.

Mixed Systems, Markets, and Governments MyLab Economics Concept Check

The differences between command economies and laissez-faire economies in their pure forms are enormous. In fact, these pure forms do not exist in the world; all real systems are in some sense "mixed." That is, individual enterprise exists and independent choice is exercised even in economies in which the government plays a major role.

Conversely, no market economies exist without government involvement and government regulation. The United States has basically a free market economy, but government purchases accounted for slightly more than 17 percent of the country's total production in 2017. Governments in the United States (local, state, and federal) directly employ about 14 percent of all workers. They also redistribute income by means of taxation and social welfare expenditures, and they regulate many economic activities.

One of the major themes in this book, and indeed in economics, is the tension between the advantages of free, unregulated markets and the desire for government involvement. Identifying what the market does well, and where it potentially fails, and exploring the role of government in dealing with market failure is a key topic in policy economics. We return to this debate many times throughout this text.

Looking Ahead

This chapter described the economic problem in broad terms. We outlined the questions that all economic systems must answer. We also discussed broadly the two kinds of economic systems. In the next chapter, we analyze the way market systems work.

SUMMARY

1. Every society has some system or process for transforming into useful form what nature and previous generations have provided. Economics is the study of that process and its outcomes.
2. *Producers* are those who take resources and transform them into usable products, or *outputs*. Private firms, households, and governments all produce something.

2.1 SCARCITY, CHOICE, AND OPPORTUNITY COST p. 50

3. All societies must answer *three basic questions*: What gets produced? How is it produced? Who gets what is produced? These three questions make up the *economic problem*.
4. One person alone on an island must make the same basic decisions that complex societies make. When a society

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