

# CHAPTER 25

## Production and Growth

When you travel around the world, you see tremendous variation in the standard of living. The average income in a rich country, such as the United States, Japan, or Germany, is about 10 times the average income in a poor country, such as India, Nigeria, or Nicaragua. These large differences in income are reflected in large differences in the quality of life. People in richer countries have better nutrition, safer housing, better healthcare, and longer life expectancy as well as more automobiles, more telephones, and more computers.

Even within a country, there are large changes in the standard of living over time. In the United States over the past century, average income as measured by real gross domestic product (GDP) per person has grown by about 2 percent per year. Although this rate of growth may seem small, it implies that average income has roughly doubled every 35 years. Because of this growth, most Americans enjoy much greater economic prosperity than did their parents, grandparents, and great-grandparents.



Growth rates vary substantially from country to country. From 1990 to 2017, GDP per person in China grew at a rate of 9 percent per year, resulting in a ten-fold increase in average income. This growth has moved China from being one of the poorest countries in the world to being a middle-income country in roughly one generation. If this rapid growth continues for another generation, China will become one of richest countries in the world. By contrast, over the same span of time, income per person in Zimbabwe fell by a total of 27 percent, leaving the typical person in that nation mired in poverty.

What explains these diverse experiences? How can rich countries maintain their high standard of living? What policies can poor countries pursue to promote more rapid growth and join the developed world? These questions are among the most important in macroeconomics. As the Nobel-Prize-winning economist Robert Lucas put it, “The consequences for human welfare in questions like these are simply staggering: Once one starts to think about them, it is hard to think about anything else.”

In the previous two chapters, we discussed how economists measure macroeconomic quantities and prices. We can now begin to study the forces that determine these variables. As we have seen, an economy’s GDP measures both the total income earned in the economy and the total expenditure on the economy’s output of goods and services. The level of real GDP is a good gauge of economic prosperity, and the growth of real GDP is a good gauge of economic progress. In this chapter we focus on the long-run determinants of the level and growth of real GDP. Later, we study the short-run fluctuations of real GDP around its long-run trend.

We proceed here in three steps. First, we examine international data on real GDP per person. These data will give you some sense of how much the level and growth of living standards vary around the world. Second, we examine the role of *productivity*—the amount of goods and services produced for each hour of work. In particular, we see that a nation’s standard of living is determined by the productivity of its workers, and we consider the factors that determine a nation’s productivity. Third, we consider the link between productivity and the economic policies that a nation pursues.

## 25-1 Economic Growth around the World

As a starting point for our study of long-run growth, let’s look at the experiences of some of the world’s economies. Table 1 shows data on real GDP per person for 13 countries. For each country, the data span more than a century of history. The first and second columns of the table present the countries and time periods. (The time periods differ somewhat from country to country because of differences in data availability.) The third and fourth columns show estimates of real GDP per person more than a century ago and for a recent year.

The data on real GDP per person show that living standards vary widely from country to country. Income per person in the United States, for instance, is now almost four times that in China and about eight times that in India. The poorest countries have average levels of income not seen in the developed world for many decades. The typical resident of Pakistan in 2017 had about the same real income as the typical resident of the United Kingdom in 1870. The typical Bangladeshi in 2017 had less real income than the typical American in 1870.

The last column of the table shows each country’s growth rate. The growth rate measures how rapidly real income per person grew in the typical year. In the United States, for example, where real income per person was \$4,443 in 1870 and

**TABLE 1****The Variety of Growth Experiences**

Country	Period	Real GDP per Person (in 2017 dollars)		
		At Beginning of Period	At End of Period	Growth Rate (per year)
China	1900–2017	\$ 794	\$16,807	2.64%
Japan	1890–2017	1,667	43,279	2.60
Brazil	1900–2017	863	15,484	2.50
Mexico	1900–2017	1,285	18,258	2.29
Indonesia	1900–2017	988	12,284	2.18
Germany	1870–2017	2,422	50,639	2.09
Canada	1870–2017	2,633	46,705	1.98
India	1900–2017	748	7,056	1.94
Argentina	1900–2017	2,542	20,787	1.81
United States	1870–2017	4,443	59,532	1.78
Pakistan	1900–2017	818	5,527	1.65
Bangladesh	1900–2017	691	3,869	1.48
United Kingdom	1870–2017	5,332	43,269	1.43

Source: Robert J. Barro and Xavier Sala-i-Martin, *Economic Growth* (New York: McGraw-Hill, 1995), Tables 10.2 and 10.3; *World Bank* online data; and author's calculations. To account for international price differences, data are PPP-adjusted when available.

\$59,532 in 2017, the growth rate was 1.78 percent per year. This means that if real income per person, beginning at \$4,443, were to increase by 1.78 percent for each of 147 years, it would end up at \$59,532. Of course, income did not rise exactly 1.78 percent every year: Some years it rose by more, other years it rose by less, and in still other years it fell. The growth rate of 1.78 percent per year ignores short-run fluctuations around the long-run trend and represents an average rate of growth for real income per person over many years.

The countries in Table 1 are ordered by growth rate from the most to the least rapid. Here you can see the large variety in growth experiences. High on the list are Brazil and China, which went from being among the poorest nations in the world to being among middle-income nations. Also high on the list is Japan, which went from being a middle-income nation to being among the richest nations.

Near the bottom of the list you can find Pakistan and Bangladesh, which were among the poorest nations at the end of the nineteenth century and remain so today. At the bottom of the list is the United Kingdom. In 1870, the United Kingdom was the richest country in the world, with average income about 20 percent higher than that of the United States and about twice Canada's. Today, average income in the United Kingdom is 27 percent below that of the United States and 7 percent below Canada's.

These data show that the world's richest countries are not guaranteed to remain the richest and that the world's poorest countries are not doomed to endless poverty. But what explains these changes over time? Why do some countries zoom ahead while others lag behind? These are precisely the questions that we take up next.

**FYI****Are You Richer Than the Richest American?**

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John D. Rockefeller

*American Heritage* magazine once published a list of the richest Americans of all time. The number 1 spot went to John D. Rockefeller, the oil entrepreneur who lived from 1839 to 1937. According to the magazine's calculations, after adjusting for inflation, his wealth would be the equivalent of about \$250 billion today, roughly twice that of Jeff Bezos, the online retailing entrepreneur who is today's richest American.

Despite his great wealth, Rockefeller did not enjoy many of the conveniences that we now take for granted. He couldn't watch television, play video games, surf the Internet, or send e-mail. During the heat of summer, he couldn't cool his home with air-conditioning. For much of his life, he couldn't travel by car or plane, and he couldn't use a telephone to call friends or family. If he became ill, he couldn't take advantage of

many medicines, such as antibiotics, that doctors today routinely use to prolong and enhance life.

Now consider: How much money would someone have to pay you to give up for the rest of your life all the modern conveniences that Rockefeller lived without? Would you do it for \$250 billion? Perhaps not. And if you wouldn't, is it fair to say that you are better off than John D. Rockefeller, allegedly the richest American ever?

As the preceding chapter discussed, standard price indexes used to compare sums of money from different times fail to fully reflect the introduction of new goods. As a result, the rate of inflation is overestimated. The flip side of this observation is that the rate of real economic growth is underestimated. Pondering Rockefeller's life shows how significant this problem might be. Because of tremendous technological advances, the average American today is arguably "richer" than the richest American a century ago, even if that fact is lost in standard economic statistics. ■

**QuickQuiz**

1. Over the past century, real GDP per person in the United States has grown about \_\_\_\_\_ percent per year, meaning it has roughly doubled every \_\_\_\_\_ years.
  - a. 2; 14
  - b. 2; 35
  - c. 5; 14
  - d. 5; 35
2. The world's rich countries, such as the United States and Germany, have income per person that is about \_\_\_\_\_ times the income per person in the world's poor countries, such as Pakistan and India.
  - a. 2
  - b. 4
  - c. 10
  - d. 30
3. Over the past century, \_\_\_\_\_ has experienced particularly strong growth, and \_\_\_\_\_ has experienced particularly weak growth.
  - a. Japan; the United Kingdom
  - b. Japan; Canada
  - c. the United Kingdom; Canada
  - d. Canada; Japan

Answers at end of chapter.

## 25-2 Productivity: Its Role and Determinants

Explaining why living standards vary so much around the world is, in one sense, very easy. The answer can be summarized in a single word—*productivity*. But in another sense, the international variation in living standards is deeply puzzling. To explain why incomes are so much higher in some countries than in others, we must look at the many factors that determine a nation's productivity.

## 25-2a Why Productivity Is So Important

Let's begin our study of productivity and economic growth by developing a simple model based loosely on Daniel Defoe's famous novel *Robinson Crusoe* about a sailor stranded on a desert island. Because Crusoe lives alone, he catches his own fish, grows his own vegetables, and makes his own clothes. We can think of Crusoe's activities—his production and consumption of fish, vegetables, and clothing—as a simple economy. By examining Crusoe's economy, we can learn some lessons that also apply to more complex and realistic economies.

What determines Crusoe's standard of living? In a word, **productivity**, the quantity of goods and services produced from each unit of labor input. If Crusoe is good at catching fish, growing vegetables, and making clothes, he lives well. If he is bad at doing these things, he lives poorly. Because Crusoe gets to consume only what he produces, his living standard is tied to his productivity.

In the case of Crusoe's economy, it is easy to see that productivity is the key determinant of living standards and that growth in productivity is the key determinant of growth in living standards. The more fish Crusoe can catch per hour, the more he eats at dinner. If Crusoe finds a better place to catch fish, his productivity rises. This increase in productivity makes Crusoe better off: He can eat the extra fish, or he can spend less time fishing and devote more time to making other goods he enjoys.

Productivity's key role in determining living standards is as true for nations as it is for stranded sailors. Recall that an economy's GDP measures two things at once: the total income earned by everyone in the economy and the total expenditure on the economy's output of goods and services. GDP can measure these two things simultaneously because, for the economy as a whole, they must be equal. Put simply, an economy's income is the economy's output.

Like Crusoe, a nation can enjoy a high standard of living only if it can produce a large quantity of goods and services. Americans live better than Nigerians because American workers are more productive than Nigerian workers. The Japanese have enjoyed more rapid growth in living standards than Argentineans because Japanese workers have experienced more rapid growth in productivity. Indeed, one of the *Ten Principles of Economics* in Chapter 1 is that a country's standard of living depends on its ability to produce goods and services.

Hence, to understand the large differences in living standards across countries or over time, we must focus on the production of goods and services. But seeing the link between living standards and productivity is only the first step. It leads naturally to the next question: Why are some economies so much better at producing goods and services than others?

## 25-2b How Productivity Is Determined

Although productivity is uniquely important in determining Robinson Crusoe's standard of living, many factors determine Crusoe's productivity. Crusoe will be better at catching fish, for instance, if he has more fishing poles, if he has been trained in the best fishing techniques, if his island has a plentiful fish supply, or if he invents a better fishing lure. Each of these determinants of Crusoe's productivity—which we can call *physical capital*, *human capital*, *natural resources*, and *technological knowledge*—has a counterpart in more complex and realistic economies. Let's consider each factor in turn.

**Physical Capital per Worker** Workers are more productive if they have tools with which to work. The stock of equipment and structures used to produce goods and services is called **physical capital**, or just *capital*. For example, when

### productivity

the quantity of goods and services produced from each unit of labor input

### physical capital

the stock of equipment and structures that are used to produce goods and services

woodworkers make furniture, they use saws, lathes, and drill presses. More tools allow the woodworkers to produce their output more quickly and more accurately: A worker with only basic hand tools can make less furniture each week than a worker with sophisticated and specialized woodworking equipment.

As you may recall, the inputs used to produce goods and services—labor, capital, and so on—are called the *factors of production*. An important feature of capital is that it is a *produced* factor of production. That is, capital is an input into the production process that in the past was an output from the production process. The woodworker uses a lathe to make the leg of a table. Earlier, the lathe itself was the output of a firm that manufactures lathes. The lathe manufacturer in turn used other equipment to make its product. Thus, capital is a factor of production used to produce all kinds of goods and services, including more capital.

#### human capital

the knowledge and skills that workers acquire through education, training, and experience

**Human Capital per Worker** A second determinant of productivity is human capital. **Human capital** is the economist's term for the knowledge and skills that workers acquire through education, training, and experience. Human capital includes the skills accumulated in early childhood programs, grade school, high school, college, and on-the-job training for adults in the labor force.

Education, training, and experience are less tangible than lathes, bulldozers, and buildings, but human capital is similar to physical capital in many ways. Like physical capital, human capital raises a nation's ability to produce goods and services. Also like physical capital, human capital is a produced factor of production. Producing human capital requires inputs in the form of teachers, libraries, and student time. Indeed, students can be viewed as "workers" who have the important job of producing the human capital that will be used in future production.

#### natural resources

the inputs into the production of goods and services that are provided by nature, such as land, rivers, and mineral deposits

**Natural Resources per Worker** A third determinant of productivity is **natural resources**. Natural resources are inputs into production that are provided by nature, such as land, rivers, and mineral deposits. Natural resources take two forms: renewable and nonrenewable. A forest is an example of a renewable resource. When one tree is cut down, a seedling can be planted in its place to be harvested in the future. Oil is an example of a nonrenewable resource. Because oil is produced by nature over many millions of years, there is only a limited supply. Once the supply of oil is depleted, it is impossible to create more.

Differences in natural resources are responsible for some of the differences in standards of living around the world. The historical success of the United States was driven in part by the large supply of land well suited for agriculture. Today, some countries in the Middle East, such as Kuwait and Saudi Arabia, are rich simply because they happen to be on top of some of the largest pools of oil in the world.

Although natural resources can be important, they are not necessary for an economy to be highly productive in producing goods and services. Japan, for instance, is one of the richest countries in the world, despite having few natural resources. International trade makes Japan's success possible. Japan imports many of the natural resources it needs, such as oil, and exports its manufactured goods to economies rich in natural resources.

#### technological knowledge

society's understanding of the best ways to produce goods and services

**Technological Knowledge** A fourth determinant of productivity is **technological knowledge**—the understanding of the best ways to produce goods and services. Two hundred years ago, most Americans worked on farms because the farm

technology available at the time required a high input of labor to feed the entire population. Today, thanks to advances in farm technology, a small fraction of the population can produce enough food to feed the entire country. This technological change freed up labor, which could then be used to produce other goods and services.

Technological knowledge takes many forms. Some technology is common knowledge—after one person uses it, everyone becomes aware of it. For example, once Henry Ford successfully introduced assembly-line production, other carmakers quickly followed suit. Other technology is proprietary—it is known only by the company that discovers it. Only the Coca-Cola Company, for instance, knows the secret recipe for making its famous soft drink. Still other technology is proprietary for a short time. When a pharmaceutical company discovers a new drug, the patent system gives that company a temporary right to be its exclusive manufacturer. When the patent expires, however, other companies are allowed to make the drug. All these forms of technological knowledge are important for the economy's production of goods and services.

It is worthwhile to distinguish between technological knowledge and human capital. They are closely related, but there is an important difference. Technological knowledge refers to society's understanding about how the world works. Human capital refers to the resources expended transmitting this understanding to the labor force. To use a relevant metaphor, technological knowledge is the quality of society's textbooks, whereas human capital is the amount of time that the population has spent reading them. Workers' productivity depends on both.

## FYI

### The Production Function

Economists often use a *production function* to describe the relationship between the quantity of inputs used in production and the quantity of output from production. For example, suppose  $Y$  denotes the quantity of output,  $L$  the quantity of labor,  $K$  the quantity of physical capital,  $H$  the quantity of human capital, and  $N$  the quantity of natural resources. Then we might write

$$Y = AF(L, K, H, N),$$

where  $F( )$  is a function that shows how the inputs are combined to produce output.  $A$  is a variable that reflects the available production technology. As technology improves,  $A$  rises, so the economy produces more output from any given combination of inputs.

Many production functions have a property called *constant returns to scale*. If a production function has constant returns to scale, then doubling all inputs causes the amount of output to double as well. Mathematically, we write that a production function has constant returns to scale if, for any positive number  $x$ ,

$$xY = AF(xL, xK, xH, xN).$$

A doubling of all inputs would be represented in this equation by  $x = 2$ . The right side shows the inputs doubling, and the left side shows output doubling.

Production functions with constant returns to scale have an interesting and useful implication. To see this implication, set  $x = 1/L$  so that the preceding equation becomes

$$Y/L = AF(1, K/L, H/L, N/L).$$

Notice that  $Y/L$  is output per worker, which is a measure of productivity. This equation says that labor productivity depends on the amounts of physical capital per worker ( $K/L$ ), human capital per worker ( $H/L$ ), and natural resources per worker ( $N/L$ ) and on the state of technology, as represented by the variable  $A$ . Thus, this equation provides a mathematical summary of the four determinants of productivity we have just discussed. ■



## ARE NATURAL RESOURCES A LIMIT TO GROWTH?

Today, the world's population is almost 8 billion, about four times what it was a century ago. At the same time, many people are enjoying a much higher standard of living than did their great-grandparents.

A perennial debate concerns whether this growth in population and living standards can continue in the future.

Many commentators have argued that natural resources will eventually limit how much the world's economies can grow. At first, this argument might seem hard to ignore. If the world has only a fixed supply of nonrenewable natural resources, how can population, production, and living standards continue to grow over time? Eventually, won't supplies of oil and minerals start to run out? When these shortages start to occur, won't they stop economic growth and, perhaps, even force living standards to fall?

Despite the apparent appeal of such arguments, most economists are less concerned about such limits to growth than one might guess. They argue that technological progress often yields ways to avoid these limits. If we compare the economy today to the economy of the past, we see various ways in which the use of natural resources has improved. Modern cars have better gas mileage. New houses have better insulation and require less energy to heat and cool. More efficient oil rigs waste less oil in the process of extraction. Recycling allows some nonrenewable resources to be reused. The development of alternative fuels, such as ethanol instead of gasoline, allows us to substitute renewable for nonrenewable resources.

Seventy years ago, some conservationists were concerned about the excessive use of tin and copper. At the time, these were crucial commodities: Tin was used to make many food containers, and copper was used to make telephone wire. Some people advocated mandatory recycling and rationing of tin and copper so that supplies would be available for future generations. Today, however, plastic has replaced tin as a material for making many food containers, and phone calls often travel over fiber-optic cables, which are made from sand. Technological progress has made once crucial natural resources less necessary.

But are all these efforts enough to sustain economic growth? One way to answer this question is to look at the prices of natural resources. In a market economy, scarcity is reflected in market prices. If the world were running out of natural resources, then the prices of those resources would be rising over time. But in fact, the opposite is more often true. Natural resource prices exhibit substantial short-run fluctuations, but over long spans of time, the prices of most natural resources (adjusted for overall inflation) are stable or falling. It appears that our ability to conserve these resources is growing more rapidly than their supplies are dwindling. Market prices give no reason to believe that natural resources are a limit to economic growth. ●

### QuickQuiz

4. Increases in the amount of human capital in the economy tend to \_\_\_\_\_ real incomes because they increase the \_\_\_\_\_ of labor.
  - a. increase; bargaining power
  - b. increase; productivity
  - c. decrease; bargaining power
  - d. decrease; productivity
5. Most economists are \_\_\_\_\_ that natural resources will eventually limit economic growth. As evidence, they note that the prices of most natural resources, adjusted for overall inflation, have tended to \_\_\_\_\_ over time.
  - a. concerned; rise
  - b. concerned; fall
  - c. not concerned; rise
  - d. not concerned; fall

*Answers at end of chapter.*

## 25-3 Economic Growth and Public Policy

So far, we have determined that a society's standard of living depends on its ability to produce goods and services and that its productivity in turn depends on physical capital per worker, human capital per worker, natural resources per worker, and technological knowledge. Let's now turn to the question faced by policymakers around the world: What can government policy do to raise productivity and living standards?

### 25-3a Saving and Investment

Because capital is a produced factor of production, a society can change the amount of capital it has. If today the economy produces a large quantity of new capital goods, then tomorrow it will have a larger stock of capital and be able to produce more goods and services. Thus, one way to raise future productivity is to devote more current resources to the production of capital.

One of the *Ten Principles of Economics* in Chapter 1 is that people face trade-offs. This principle is especially important when considering the accumulation of capital. Because resources are scarce, devoting more resources to producing capital requires devoting fewer resources to producing goods and services for current consumption. That is, for society to invest more in capital, it must consume less and save more of its current income. The growth that arises from capital accumulation is not a free lunch: It requires that society sacrifice consumption of goods and services in the present to enjoy higher consumption in the future.

The next chapter examines in more detail how an economy's financial markets coordinate saving and investment. It also examines how government policies influence the amount of saving and investment that take place. At this point, it is important to note that encouraging saving and investment is one way that a government can encourage growth and, in the long run, raise an economy's standard of living.

### 25-3b Diminishing Returns and the Catch-Up Effect

Suppose that a government pursues policies that raise the nation's saving rate—the percentage of GDP devoted to saving rather than consumption. What happens? With the nation saving more, fewer resources are needed to make consumption goods and more resources are available to make capital goods. As a result, the capital stock increases, leading to rising productivity and more rapid growth in GDP. But how long does this higher rate of growth last? Assuming that the saving rate remains at its new, higher level, does the growth rate of GDP stay high indefinitely or only for a period of time?

The traditional view of the production process is that capital is subject to **diminishing returns**: As the stock of capital rises, the extra output produced from an additional unit of capital falls. In other words, when workers already have a large quantity of capital to use in producing goods and services, giving them an additional unit of capital increases their productivity only slightly. This phenomenon is illustrated in Figure 1, which shows how the amount of capital per worker determines the amount of output per worker, holding constant all the other determinants of output (such as natural resources and technological knowledge). Capital's diminishing returns is sometimes called the *diminishing marginal product of capital*.

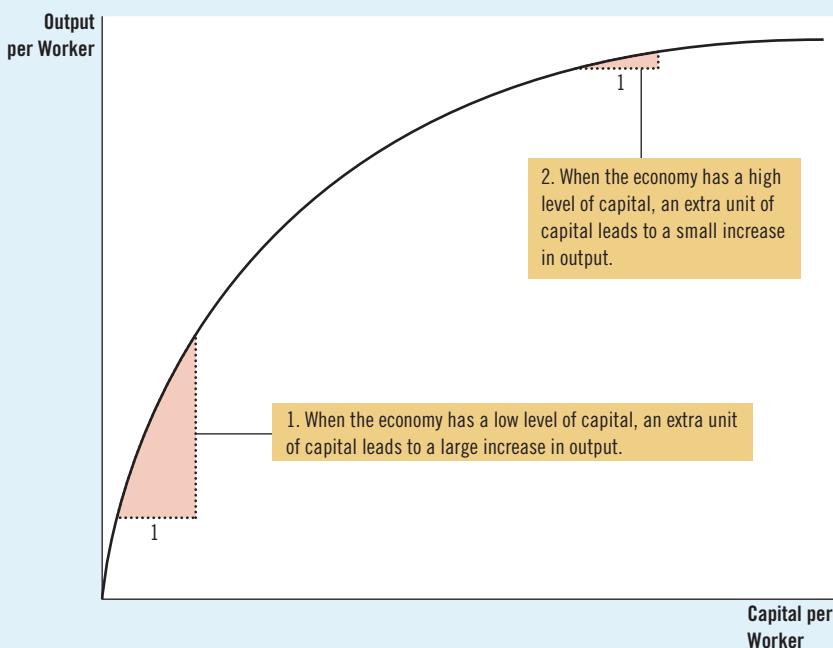
Because of diminishing returns, an increase in the saving rate leads to higher growth only for a while. As the higher saving rate allows more capital to be accumulated, the benefits from additional capital become smaller over time, and so growth slows down. *In the long run, the higher saving rate leads to a higher level of productivity and income but not to higher growth in these variables.* Reaching this long run, however, can take quite a while. According to studies of international data on

#### **diminishing returns**

the property whereby the benefit from an extra unit of an input declines as the quantity of the input increases

**FIGURE 1****Illustrating the Production Function**

This figure shows how the amount of capital per worker influences the amount of output per worker. Other determinants of output, including human capital, natural resources, and technology, are held constant. The curve becomes flatter as the amount of capital increases because of diminishing returns to capital.



economic growth, increasing the saving rate can lead to substantially higher growth for a period of several decades.

The property of diminishing returns to capital has another important implication: Other things being equal, it is easier for a country to grow fast if it starts out relatively poor. This effect of initial conditions on subsequent growth is sometimes called the **catch-up effect**. In poor countries, workers lack even the most rudimentary tools and, as a result, have low productivity. Thus, small amounts of capital investment can substantially raise these workers' productivity. By contrast, workers in rich countries have high productivity partly because they have large amounts of capital with which to work. When the amount of capital per worker is already so high, additional capital investment has a relatively small effect on productivity. Studies of international data on economic growth confirm this catch-up effect: Controlling for other variables, such as the percentage of GDP devoted to investment, poor countries tend to grow at faster rates than rich countries.

This catch-up effect can help explain some otherwise puzzling facts. Here's an example: From 1960 to 1990, the United States and South Korea devoted a similar share of GDP to investment. Yet over this time, the United States experienced only moderate growth of about 2 percent, while South Korea experienced spectacular growth of more than 6 percent. The explanation is the catch-up effect. In 1960, South Korea had GDP per person less than one-tenth the U.S. level, in part because previous investment had been so low. With a small initial capital stock, South Korea realized greater benefits to capital accumulation and thus had a higher subsequent growth rate.

This catch-up effect shows up in other aspects of life. When a school gives an end-of-year award to the "Most Improved" student, that student is usually one who began the year with relatively poor performance. Students who began the year not studying find improvement easier than students who always worked hard. Note that it is good to be "Most Improved," given the starting point, but it is even

**catch-up effect**

the property whereby countries that start off poor tend to grow more rapidly than countries that start off rich

better to be “Best Student.” Similarly, economic growth between 1960 and 1990 was much more rapid in South Korea than in the United States, but GDP per person was still higher in the United States.

### 25-3c Investment from Abroad

So far, we have discussed how policies aimed at increasing a country’s saving rate can increase investment and long-term economic growth. Yet saving by domestic residents is not the only way for a country to invest in new capital. The other way is investment by foreigners.

Investment from abroad takes several forms. Ford Motor Company might build a car factory in Mexico. A capital investment that is owned and operated by a foreign entity is called *foreign direct investment*. Alternatively, an American might buy stock in a Mexican corporation (that is, buy a share in the ownership of the corporation), and the corporation can use the proceeds from the stock sale to build a new factory. An investment financed with foreign money but operated by domestic residents is called *foreign portfolio investment*. In both cases, Americans provide the resources necessary to increase the stock of capital in Mexico. That is, American saving is being used to finance Mexican investment.

When foreigners invest in a country, they do so because they expect to earn a return on their investment. Ford’s car factory increases the Mexican capital stock and, therefore, increases Mexican productivity and Mexican GDP. Yet Ford takes some of this additional income back to the United States in the form of profit. Similarly, when an American investor buys Mexican stock, the investor has a right to a portion of the profit that the Mexican corporation earns.

Investment from abroad, therefore, does not have the same effect on all measures of economic prosperity. Recall that a country’s gross domestic product (GDP) is the income earned within the country by both residents and nonresidents, whereas a country’s gross national product (GNP) is the income earned by residents of the country both at home and abroad. When Ford opens its car factory in Mexico, some of the income the factory generates accrues to people who do not live in Mexico. As a result, foreign investment in Mexico raises the income of Mexicans (measured by GNP) by less than it raises the production in Mexico (measured by GDP).

Nonetheless, investment from abroad is one way for a country to grow. Even though some of the benefits from this investment flow back to the foreign owners, this investment does increase the economy’s stock of capital, leading to higher productivity and higher wages. Moreover, investment from abroad is one way for poor countries to learn the state-of-the-art technologies developed and used in richer countries. For these reasons, many economists who advise governments in less developed economies advocate policies that encourage investment from abroad. Often, this means removing restrictions that governments have imposed on foreign ownership of domestic capital.

An organization that tries to encourage the flow of capital to poor countries is the World Bank. This international organization obtains funds from the world’s advanced countries, such as the United States, and uses these resources to make loans to less developed countries so that they can invest in roads, sewer systems, schools, and other types of capital. It also offers the countries advice about how the funds might best be used. The World Bank and its sister organization, the International Monetary Fund, were set up after World War II. One lesson from the war was that economic distress often leads to political turmoil, international tensions, and military conflict. Thus, every country has an interest in promoting economic prosperity around the world. The World Bank and the International Monetary Fund were established to achieve that common goal.

### 25-3d Education

Education—investment in human capital—is at least as important as investment in physical capital for a country’s long-run economic success. In the United States, each year of schooling has historically raised a person’s wage by an average of about 10 percent. In less developed countries, where human capital is especially scarce, the gap between the wages of educated and uneducated workers is even larger. Thus, government policy can enhance the standard of living by providing good schools and encouraging the population to take advantage of them.

Investment in human capital, like investment in physical capital, has an opportunity cost. When students are in school, they forgo the wages they could have earned as members of the labor force. In less developed countries, children often drop out of school at an early age, even though the benefit of additional schooling is very high, simply because their labor is needed to help support the family.

Some economists have argued that human capital is particularly important for economic growth because human capital confers positive externalities. An *externality* is the effect of one person’s actions on the well-being of a bystander. An educated person, for instance, might generate new ideas about how best to produce goods and services. If these ideas enter society’s pool of knowledge so that everyone can use them, then the ideas are an external benefit of education. In this case, the return from schooling for society is even greater than the return for the individual. This argument would justify the large subsidies to human-capital investment that we observe in the form of public education.

One problem facing some poor countries is the *brain drain*—the emigration of many of the most highly educated workers to rich countries, where these workers can enjoy a higher standard of living. If human capital does have positive externalities, then this brain drain makes those people left behind even poorer. This problem offers policymakers a dilemma. On the one hand, the United States and other rich countries have the best systems of higher education, and it would seem natural for poor countries to send their best students abroad to earn higher degrees. On the other hand, those students who have spent time abroad may choose not to return home, and this brain drain will reduce the poor nation’s stock of human capital even further.

### 25-3e Health and Nutrition

The term *human capital* usually refers to education, but it can also be used to describe another type of investment in people: expenditures that lead to a healthier population. Other things being equal, healthier workers are more productive. The right investments in the health of the population provide one way for a nation to increase productivity and raise living standards.

According to the late economic historian Robert Fogel, improved health from better nutrition has been a significant factor in long-run economic growth. Fogel estimated that in Great Britain in 1780, about one in five people were so malnourished that they were incapable of manual labor. Among those who could work, insufficient caloric intake substantially reduced the work effort they could put forth. As nutrition improved, so did workers’ productivity.

Fogel studied these historical trends in part by looking at the height of the population. Short stature can be an indicator of malnutrition, especially during gestation and the early years of life. Fogel found that as nations develop economically, people eat more and the population gets taller. From 1775 to 1975, the average caloric intake in Great Britain rose by 26 percent and the height of the average man rose by 3.6 inches. Similarly, during the spectacular economic growth in South Korea from 1962 to 1995, caloric consumption rose by 44 percent and average male height

rose by 2 inches. Of course, a person's height is determined by a combination of genetics and environment. But because the genetic makeup of a population is slow to change, such increases in average height are most likely due to changes in the environment—nutrition being the obvious explanation.

Moreover, studies have found that height is an indicator of productivity. Looking at data on a large number of workers at a point in time, researchers have found that taller workers tend to earn more. Because wages reflect a worker's productivity, this finding suggests that taller workers tend to be more productive. The effect of height on wages is especially pronounced in poorer countries, where malnutrition is a bigger risk.

Fogel won the Nobel Prize in Economics in 1993 for his work in economic history, which includes not only his studies of nutrition but also his studies of American slavery and the role of railroads in the development of the American economy. In the lecture he gave when he was awarded the prize, he surveyed the evidence on health and economic growth. He concluded that "improved gross nutrition accounts for roughly 30 percent of the growth of per capita income in Britain between 1790 and 1980."

Today, malnutrition is fortunately rare in developed nations such as Great Britain and the United States. (Obesity is a more widespread problem.) But for people in developing nations, poor health and inadequate nutrition remain obstacles to higher productivity and improved living standards. The United Nations estimates that about a quarter of the population in sub-Saharan Africa is undernourished.

The causal link between health and wealth runs in both directions. Poor countries are poor in part because their populations are not healthy, and their populations are not healthy in part because they are poor and cannot afford adequate healthcare and nutrition. It is a vicious circle. But this fact opens the possibility of a virtuous circle: Policies that lead to more rapid economic growth would naturally improve health outcomes, which in turn would further promote economic growth.

### **25-3f Property Rights and Political Stability**

Another way policymakers can foster economic growth is by protecting property rights and promoting political stability. This issue goes to the very heart of how market economies work.

Production in market economies arises from the interactions of millions of individuals and firms. When you buy a car, for instance, you are buying the output of a car dealer, a car manufacturer, a steel company, an iron ore mining company, and so on. This division of production among many firms allows the economy's factors of production to be used as effectively as possible. To achieve this outcome, the economy has to coordinate transactions among these firms, as well as between firms and consumers. Market economies achieve this coordination through market prices. That is, market prices are the instrument with which the invisible hand of the marketplace brings supply and demand into balance in each of the many thousands of markets that make up the economy.

An important prerequisite for the price system to work is an economy-wide respect for *property rights*. Property rights refer to the ability of people to exercise authority over the resources they own. A mining company will not make the effort to mine iron ore if it expects the ore to be stolen. The company mines the ore only if it is confident that it will benefit from the ore's subsequent sale. For this reason, courts serve an important role in a market economy: They enforce property rights. Through the criminal justice system, the courts discourage theft. In addition, through the civil justice system, the courts ensure that buyers and sellers live up to their contracts.

Those of us in developed countries tend to take property rights for granted, but those living in less developed countries understand that a lack of property rights can be a major problem. In many countries, the system of justice does not work well. Contracts are hard to enforce, and fraud often goes unpunished. In more extreme cases, the government not only fails to enforce property rights but actually infringes upon them. To do business in some countries, firms are expected to bribe government officials. Such corruption impedes the coordinating power of markets. It also discourages domestic saving and investment from abroad.

One threat to property rights is political instability. When revolutions and coups are common, there is doubt about whether property rights will be respected in the future. If a revolutionary government might confiscate the capital of some businesses, as was often true after communist revolutions, domestic residents have less incentive to save, invest, and start new businesses. At the same time, foreigners have less incentive to invest in the country. Even the threat of revolution can act to depress a nation's standard of living.

Thus, economic prosperity depends in part on favorable political institutions. A country with an efficient court system, honest government officials, and a stable constitution will enjoy a higher standard of living than a country with a poor court system, corrupt officials, and frequent revolutions and coups.

### 25-3g Free Trade

Some of the world's poorest countries have tried to achieve more rapid economic growth by pursuing *inward-oriented policies*. These policies aim to increase productivity and living standards within the country by avoiding interaction with the rest of the world. Domestic firms often advance the infant-industry argument, claiming that they need protection from foreign competition to thrive and grow. Together with a general distrust of foreigners, this argument has at times led policymakers in less developed countries to impose tariffs and other trade restrictions.

Most economists today believe that poor countries are better off pursuing *outward-oriented policies* that integrate these countries into the world economy. International trade in goods and services can improve the economic well-being of a country's citizens. Trade is, in some ways, a type of technology. When a country exports wheat and imports textiles, the country benefits as if it had invented a technology for turning wheat into textiles. A country that eliminates trade restrictions will, therefore, experience the same kind of economic growth that would occur after a major technological advance.

The adverse impact of inward orientation becomes clear when one considers the small size of many less developed economies. The total GDP of Argentina, for instance, is roughly equal to that of Ohio. Imagine what would happen if the Ohio legislature were to prohibit state residents from trading with people living in other states. Without being able to take advantage of the gains from trade, Ohio would need to produce all the goods it consumes. It would also have to produce all its own capital goods, rather than importing state-of-the-art equipment from other states. Living standards in Ohio would fall immediately, and the problem would likely only get worse over time. This is precisely what happened when Argentina pursued inward-oriented policies throughout much of the 20th century. In contrast, countries that pursued outward-oriented policies, such as South Korea, Singapore, and Taiwan, enjoyed high rates of economic growth.

The amount that a nation trades with others is determined not only by government policy but also by geography. Countries with natural seaports find trade easier than those without this resource. It is not a coincidence that many of the

world's major cities, such as New York, San Francisco, and Hong Kong, are located next to oceans. Similarly, because landlocked countries find international trade more difficult, they tend to have lower levels of income than countries with easy access to the world's waterways.

### 25-3h Research and Development

The primary reason that living standards are higher today than they were a century ago is that technological knowledge has advanced. The telephone, the transistor, the computer, and the internal combustion engine are among the thousands of innovations that have improved the ability to produce goods and services.

Most technological advances come from private research by firms and individual inventors, but there is also a public interest in promoting these efforts. To a large extent, knowledge is a *public good*: That is, once one person discovers an idea, the idea enters society's pool of knowledge and other people can freely use it. Just as government has a role in providing a public good such as national defense, it also has a role in encouraging the research and development of new technologies.

The U.S. government has long played a role in the creation and dissemination of technological knowledge. A century ago, the government sponsored research about farming methods and advised farmers how best to use their land. More recently, the U.S. government, through the Air Force and NASA, has supported aerospace research; as a result, the United States is a leading maker of rockets and planes. The government continues to encourage advances in knowledge with research grants from the National Science Foundation and the National Institutes of Health and with tax breaks for firms engaging in research and development.

Yet another way in which government policy encourages research is through the patent system. When a person or firm creates an innovative product, such as a new drug, the inventor can apply for a patent. If the product is deemed truly original, the government awards the patent, which gives the inventor the exclusive right to make the product for a specified number of years. In essence, the patent gives the inventor a property right over her invention, turning her new idea from a public good into a private good. By allowing inventors to profit from their inventions—even if only temporarily—the patent system increases the incentive for individuals and firms to engage in research.

### 25-3i Population Growth

Economists and other social scientists have long debated how population affects a society. The most direct effect is on the size of the labor force: A large population means there are more workers to produce goods and services. The tremendous size of the Chinese population is one reason China is such an important player in the world economy.

At the same time, however, a large population means there are more people to consume those goods and services. So while a large population means a larger total output of goods and services, it need not mean a higher standard of living for the typical citizen. Indeed, both large and small nations are found at all levels of economic development.

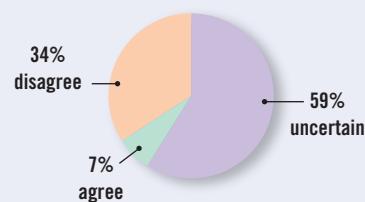
Beyond these obvious effects of population size, population growth interacts with the other factors of production in ways that are more subtle and open to debate.



### Innovation and Growth

"Future innovations worldwide will not be transformational enough to promote sustained per-capita economic growth rates in the United States and western Europe over the next century as high as those over the past 150 years."

#### What do economists say?



Source: IGM Economic Experts Panel, February 11, 2014.



2002 APPL/TOPPHOTO/THE IMAGE WORKS

Thomas Robert Malthus

**Stretching Natural Resources** Thomas Robert Malthus (1766–1834), an English minister and early economic thinker, is famous for his book called *An Essay on the Principle of Population as It Affects the Future Improvement of Society*. In it, he offered what may be history's most chilling forecast. Malthus argued that an ever-increasing population would continually strain society's ability to provide for itself. As a result, mankind was doomed to forever live in poverty.

Malthus's logic was simple. He began by noting that "food is necessary to the existence of man" and that "the passion between the sexes is necessary and will remain nearly in its present state." He concluded that "the power of population is infinitely greater than the power in the earth to produce subsistence for man." According to Malthus, the only check on population growth was "misery and vice." Attempts by charities or governments to alleviate poverty were counterproductive, he argued, because they merely allowed the poor to have more children, placing even greater strains on society's productive capabilities.

Malthus may have correctly described the world at the time when he lived, but fortunately, his dire forecast was far off the mark. World population has increased about sixfold over the past two centuries, but living standards around the world have significantly increased as well. As a result of economic growth, chronic hunger and malnutrition are less common now than they were in Malthus's day. Modern famines occur from time to time but more often result from income inequality or political instability than from inadequate food production.

Where did Malthus go wrong? As we discussed in a case study earlier in this chapter, growth in human ingenuity has offset the effects of a larger population. Pesticides, fertilizers, mechanized farm equipment, new crop varieties, and other technological advances that Malthus never imagined have allowed each farmer to feed ever greater numbers of people. Even with more mouths to feed, fewer farmers are necessary because each farmer is much more productive.

**Diluting the Capital Stock** Whereas Malthus worried about the effects of population on the use of natural resources, some modern theories of economic growth emphasize its effects on capital accumulation. According to these theories, high population growth reduces GDP per worker because rapid growth in the number of workers forces the capital stock to be spread more thinly. In other words, when population growth is rapid, each worker is equipped with less capital. A smaller quantity of capital per worker leads to lower productivity and lower GDP per worker.

This problem is most apparent in the case of human capital. Countries with high population growth have large numbers of school-age children. This places a larger burden on the educational system. It is not surprising, therefore, that educational attainment tends to be low in countries with high population growth.

The differences in population growth around the world are large. In developed countries, such as the United States and those in Western Europe, the population has risen only about 1 percent per year in recent decades and is expected to rise even more slowly in the future. By contrast, in many poor African countries, population grows at about 3 percent per year. At this rate, the population doubles every 23 years. This rapid population growth makes it harder to provide workers with the tools and skills they need to achieve high levels of productivity.

Rapid population growth is not the main reason that less developed countries are poor, but some analysts believe that reducing the rate of population growth would help these countries raise their standards of living. In some countries, this goal is accomplished directly with laws that regulate the number of children families

may have. For example, from 1980 to 2015, China allowed only one child per family; couples who violated this rule were subject to substantial fines. In countries with greater freedom, the goal of reduced population growth is accomplished less directly by increasing awareness of birth control techniques.

Another way in which a country can influence population growth is to apply one of the *Ten Principles of Economics*: People respond to incentives. Bearing a child, like any decision, has an opportunity cost. When the cost rises, people choose to have smaller families. In particular, women with good educations and employment prospects tend to want fewer children than those with fewer opportunities outside the home. Hence, policies that foster equal treatment of women are one way for less developed economies to reduce their rates of population growth and raise their standards of living.

**Promoting Technological Progress** Rapid population growth may depress economic prosperity by reducing the amount of capital each worker has, but it may also have some benefits. Some economists have suggested that world population growth has been an engine of technological progress and economic prosperity. The mechanism is simple: If there are more people, then there are more scientists, inventors, and engineers to contribute to technological advance, which benefits everyone.

Economist Michael Kremer provided some support for this hypothesis in an article titled “Population Growth and Technological Change: One Million b.c. to 1990,” which was published in the *Quarterly Journal of Economics* in 1993. Kremer began by noting that over the broad span of human history, world growth rates have increased with world population. For example, world growth was more rapid when the world population was 1 billion (around the year 1800) than when the population was only 100 million (around 500 b.c.). This fact is consistent with the hypothesis that a larger population induces more technological progress.

Kremer’s second piece of evidence comes from comparing regions of the world. The melting of the polar icecaps at the end of the Ice Age around 10,000 b.c. flooded the land bridges and separated the world into several distinct regions that could not communicate with one another for thousands of years. If technological progress is more rapid when there are more people to discover things, then the more populous regions should have experienced more rapid growth.

According to Kremer, that is exactly what happened. The most successful region of the world in 1500 (when Columbus reestablished contact) comprised the “Old World” civilizations of the large Eurasia-Africa region. Next in technological development were the Aztec and Mayan civilizations in the Americas, followed by the hunter-gatherers of Australia, and then the primitive people of Tasmania, who lacked even fire-making and most stone and bone tools.

The smallest isolated region was Flinders Island, a tiny island between Tasmania and Australia. With the smallest population, Flinders Island had the fewest opportunities for technological advance and, indeed, seemed to regress. Around 3000 b.c., human society on Flinders Island died out completely. The larger population, Kremer concluded, the greater the potential for technological advance.

### CASE STUDY

#### WHY IS SO MUCH OF AFRICA POOR?

Many of the poorest people on the planet live in sub-Saharan Africa. In 2017, GDP per person in this region (measured in 2011 dollars) was only \$3,489, just 23 percent of the world average. It is not surprising, then, that sub-Saharan Africa has a high rate of extreme poverty: 41 percent of

its population lives on less than \$1.90 per day, compared with 10 percent of the population worldwide.

What explains this low level of economic development? There is no easy answer. Many interrelated forces are at work, and sometimes it is hard to distinguish the causes of poverty from the effects. But here are some of the factors that may help explain this distressing phenomenon.

*Low capital investment.* Because sub-Saharan Africa has low levels of income and capital per worker, one might expect the returns to capital to be high, making the region an attractive place to invest for both domestic savers and investors abroad. But, in fact, as a percentage of GDP, investment in sub-Saharan Africa is 5 percentage points lower than the world average. The low level of investment may be driven by some of the following factors.

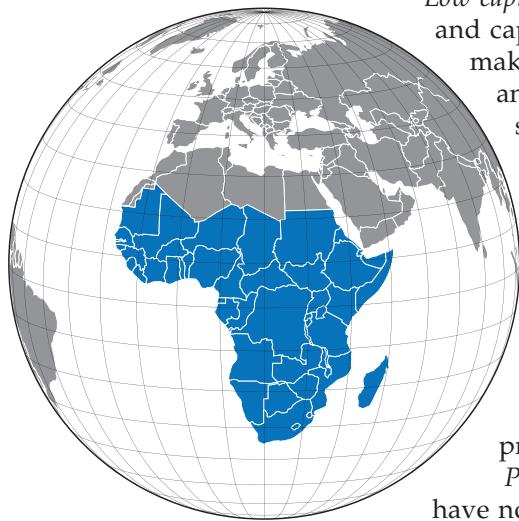
*Low educational attainment.* Those living in sub-Saharan Africa have on average only 5.6 years of schooling, compared with 8.4 years of schooling worldwide. And their quality of schooling is lower as well: The student-teacher ratio in primary schools is 39 in sub-Saharan Africa, compared with a world average of 23. As a result, only 60 percent of adults in sub-Saharan Africa are literate, compared with 82 percent of adults worldwide. Less educated workers are less productive.

*Poor health.* Among one-year-olds in sub-Saharan Africa, 21 percent have not been immunized for DPT (diphtheria, pertussis, and tetanus), and 31 percent have not been immunized for measles—in both cases, about twice the world average. Among children under age 5, 36 percent are malnourished enough to have stunted growth, compared with 27 percent worldwide. Among adults, 4.5 percent are infected with HIV, four times the world average. These statistics not only reflect extreme personal tragedy but also help explain an economic one. Less healthy workers are less productive.

*High population growth.* The population in sub-Saharan Africa has recently grown about 2.8 percent per year, meaning the population doubles every 25 years. By contrast, the world population has grown at 1.2 percent per year, doubling every 58 years. Rapid population growth makes it hard to equip workers with the physical and human capital needed to achieve high productivity.

*Geographic disadvantages.* More than 25 percent of the people in sub-Saharan Africa live in a landlocked nation, such as Ethiopia, Uganda, Chad, Niger, and Mali, compared with 7 percent of the world population. Landlocked nations tend to be poor. Without easy access to the oceans for purposes of transport, it is difficult for them to take advantage of the gains from trade.

*Restricted freedom.* Social scientists have developed indexes to gauge the degree of human freedom available to a nation's citizens. These indexes measure characteristics such as the reliability of the justice system, personal security and safety, freedom of expression, the right to engage in international trade, and so on. Nations in sub-Saharan Africa tend to rank low on these measures, as do those in South Asia, Eastern Europe, and the Middle East. The freest nations tend to be those in Western Europe, Northern Europe, and North America. (Other regions of the world, such as South America, fall between these extreme cases.) These freedom indexes are positively correlated with economic prosperity: Greater freedom is associated with higher incomes, perhaps because restrictions on freedom impede the invisible hand's ability to allocate resources efficiently.



*Sub-Saharan Africa is the poorest region of the world.*

*Rampant corruption.* The governments in many African nations exhibit high levels of corruption. According to Transparency International, a nonprofit organization that monitors corruption, the African nation of Somalia was the most corrupt country in the world in 2018. Of the 14 most corrupt nations, more than half were in sub-Saharan Africa. (None were in North America or Europe.) High levels of corruption discourage domestic residents from saving and investing and deter investment from abroad.

*The legacy of colonization.* Economists Daron Acemoglu and James Robinson attribute the low level of economic development in much of Africa to flawed institutions, which they trace back to colonization. In the 17th and 18th centuries, when Europeans were looking for places to colonize and settle, they preferred locations with moderate climates, such as the United States, Canada, and New Zealand. Because the colonizers planned to stay there, they brought *inclusive institutions* like those in Europe. Inclusive institutions spread political power widely, respect property rights and the rule of law, and thereby foster economic prosperity. In places with less appealing tropical climates, including much of Africa, the colonizers had little interest in permanent settlement. As a result, they established *extractive institutions*, such as authoritarian governments, designed to exploit the region's population and natural resources. Even after the colonizers left, the extractive institutions remained and were taken over by new ruling elites, impeding economic development.

None of these causes suggests an easy solution to Africa's problems. But neither is poverty a foregone conclusion. Through a combination of good policy and good luck, the African nation of Botswana has managed to become a middle-income country, with GDP per person about equal to the world average and a rate of extreme poverty less than half of that in the rest of sub-Saharan Africa. Botswana has the disadvantage of being landlocked, and it is plagued by widespread HIV. But compared with most of its neighbors, Botswana has higher investment, better education, lower population growth, higher vaccination rates, lower malnutrition, greater freedoms, and less corruption. It has successfully transitioned from once being a colonized country to now being Africa's oldest continuous democracy. In many ways, Botswana is a role model for what a nation can accomplish by focusing on the forces that shape economic growth. ●

### QuickQuiz

6. Because capital is subject to diminishing returns, higher saving and investment do not lead to higher
  - a. income in the long run.
  - b. income in the short run.
  - c. growth in the long run.
  - d. growth in the short run.
7. When the Japanese car maker Toyota expands one of its car factories in the United States, what is the likely impact of this event on the gross domestic product and gross national product of the United States?
  - a. GDP rises and GNP falls.
  - b. GNP rises and GDP falls.
  - c. GDP and GNP both rise but GDP rises by more.
  - d. GDP and GNP both rise but GNP rises by more.
8. Thomas Robert Malthus believed that population growth would
  - a. put stress on the economy's ability to produce food, dooming humans to remain in poverty.
  - b. spread the capital stock too thinly across the labor force, lowering each worker's productivity.
  - c. promote technological progress, because there would be more scientists and inventors.
  - d. eventually decline to sustainable levels, as birth control improved and people had smaller families.

Answers at end of chapter.


**IN THE  
NEWS**

## The Secret Sauce of American Prosperity

*Among large countries, the United States has long had the highest average income. Here, an economist ponders the reasons for that success.*

### Why the U.S. Is Still Richer Than Every Other Large Country

By Martin Feldstein

Each year, the United States produces more per person than most other advanced economies. In 2015 real GDP per capita was \$56,000 in the United States. The real GDP per capita in that same year was only \$47,000 in Germany, \$41,000 in France and the United Kingdom, and just \$36,000 in Italy, adjusting for purchasing power.

In short, the U.S. remains richer than its peers. But why? I can think of 10 features that distinguish America from other industrial economies. . . .

*An entrepreneurial culture.* Individuals in the U.S. demonstrate a desire to start businesses and grow them, as well as a willingness to take risks. There is less penalty

in U.S. culture for failing and starting again. Even students who have gone to college or a business school show this entrepreneurial desire, and it is self-reinforcing: Silicon Valley successes like Facebook inspire further entrepreneurship.

*A financial system that supports entrepreneurship.* The U.S. has a more developed system of equity finance than the countries of Europe, including angel investors willing to finance startups and a very active venture capital market that helps finance the growth of those firms. We also have a decentralized banking system, including more than 7,000 small banks, that provides loans to entrepreneurs.

*World-class research universities.* U.S. universities produce much of the basic research that drives high-tech entrepreneurship. Faculty members and doctoral graduates often spend time with nearby startups, and the culture of both the universities and the businesses encourage this overlap. Top research universities attract talented students from around the world, many of whom end up remaining in the United States.

*Labor markets that generally link workers and jobs unimpeded by large trade unions, state-owned enterprises, or excessively restrictive labor regulations.* Less than 7% of the private sector U.S. labor force is unionized, and there are virtually no state-owned enterprises. While the U.S. does regulate working conditions and hiring, the rules are much less onerous than in Europe. As a result, workers have a better chance of finding the right job, firms find it easier to innovate, and new firms find it easier to get started.

*A growing population, including from immigration.* America's growing population means a younger and therefore more flexible and trainable workforce. Although there are restrictions on immigration to the United States, there are also special rules that provide access to the U.S. economy and a path for citizenship (green cards), based on individual talent and industrial sponsorship. A separate "green card lottery" provides a way for eager people to come to the United States. The country's ability to attract immigrants has been an important reason for its prosperity.

### 25-4 Conclusion: The Importance of Long-Run Growth

In this chapter, we have discussed what determines the standard of living in a nation and how policymakers can try to raise it through policies that promote economic growth. Most of this chapter is summarized in one of the *Ten Principles of Economics*: A country's standard of living depends on its ability to produce goods and services. Policymakers who want to foster growth in living standards must aim to increase their nation's productive ability by encouraging rapid accumulation of the factors of production and ensuring that these factors are employed as effectively as possible.

Economists differ in their views on the role of government in promoting economic growth. At the very least, government can lend support to the invisible hand by maintaining property rights and political stability. More controversial is whether government should target and subsidize specific industries that might be especially important for technological progress. There is no doubt that these issues are among the most important in economics. The success of one generation's policymakers in learning and heeding the fundamental lessons about economic growth determines what kind of world the next generation will inherit.

*A culture (and a tax system) that encourages hard work and long hours.* The average employee in the United States works 1,800 hours per year, substantially more than the 1,500 hours worked in France and the 1,400 hours worked in Germany (though not as much as the 2,200+ in Hong Kong, Singapore, and South Korea). In general, working longer means producing more, which means higher real incomes.

*A supply of energy that makes North America energy independent.* Natural gas fracking in particular has provided U.S. businesses with plentiful and relatively inexpensive energy.

*A favorable regulatory environment.* Although U.S. regulations are far from perfect, they are less burdensome on businesses than the regulations imposed by European countries and the European Union.

*A smaller size of government than in other industrial countries.* According to the OECD, outlays of the U.S. government at the federal, state, and local levels totaled 38% of GDP, while the corresponding figure was 44% in Germany, 51% in Italy, and 57% in France. The higher level of government spending in other countries implies not only a higher share of income taken in taxes but also higher transfer

payments that reduce incentives to work. It's no surprise that Americans work a lot; they have extra incentive to do so.

*A decentralized political system in which states compete.* Competition among states encourages entrepreneurship and work, and states compete for businesses and for individual residents with their legal rules and tax regimes. Some states have no income taxes and have labor laws that limit unionization. States provide high-quality universities with low tuition for in-state students. They compete in their legal liability rules, too. The legal systems attract both new entrepreneurs and large corporations. The United States is perhaps unique among high-income nations in its degree of political decentralization.

Will America maintain these advantages? In his 1942 book, *Socialism, Capitalism, and Democracy*, Joseph Schumpeter warned that capitalism would decline and fail because the political and intellectual environment needed for capitalism to flourish would be undermined by the success of capitalism and by the critique of intellectuals. He argued that popularly elected social democratic parties would create a welfare state that would restrict entrepreneurship.

Although Schumpeter's book was published more than 20 years after he had moved from Europe to the United States, his warning seems more appropriate to Europe today than to the United States. The welfare state has grown in the United States, but much less than it has grown in Europe. And the intellectual climate in the United States is much more supportive of capitalism.

If Schumpeter were with us today, he might point to the growth of the social democratic parties in Europe and the resulting expansion of the welfare state as reasons why the industrial countries of Europe have not enjoyed the same robust economic growth that has prevailed in the United States. ■

### Questions to Discuss

1. Which attributes of the United States listed in this article do you think best explain U.S. prosperity? Why?
2. Which of the attributes listed in this article do you think are most at risk of being undermined by poor policy choices? Why?

*Mr. Feldstein is a professor of economics at Harvard University.*

**Source:** Harvard Business Review, April 20, 2017.

## CHAPTER IN A NUTSHELL

- Economic prosperity, as measured by GDP per person, varies substantially around the world. The average income in the world's richest countries is more than 10 times that in the world's poorest countries. Because growth rates of real GDP also vary substantially, the relative positions of countries can change dramatically over time.
- The standard of living in an economy depends on the economy's ability to produce goods and services. Productivity, in turn, depends on the physical capital, human capital, natural resources, and technological knowledge available to workers.
- Government policies can try to influence the economy's growth rate in many ways: by encouraging saving and investment, facilitating investment from abroad, fostering education, promoting good health, maintaining property rights and political stability, allowing free trade, and supporting the research and development of new technologies.
- The accumulation of capital is subject to diminishing returns: The more capital an economy has, the less additional output the economy gets from an extra unit of capital. As a result, although higher saving leads to higher growth for a period of time, growth eventually slows down as capital, productivity, and income rise. Also because of diminishing returns, the return to capital is especially high in poor countries. Other things being equal, these countries can grow faster because of the catch-up effect.

- Population growth has a variety of effects on economic growth. On the one hand, more rapid population growth may lower productivity by stretching the supply of natural resources and by reducing the amount

of capital available to each worker. On the other hand, a larger population may enhance the rate of technological progress because there are more scientists and engineers.

## KEY CONCEPTS

productivity, *p. 509*  
 physical capital, *p. 509*  
 human capital, *p. 510*

natural resources, *p. 510*  
 technological knowledge, *p. 510*  
 diminishing returns, *p. 513*

catch-up effect, *p. 514*

## QUESTIONS FOR REVIEW

- What does the level of a nation's GDP measure? What does the growth rate of GDP measure? Would you rather live in a nation with a high level of GDP and a low growth rate or in a nation with a low level of GDP and a high growth rate?
- List and describe four determinants of productivity.
- In what way is a college degree a form of capital?
- Explain how higher saving leads to a higher standard of living. What might deter a policymaker from trying to raise the rate of saving?
- Does a higher rate of saving lead to higher growth temporarily or indefinitely?
- Why would removing a trade restriction, such as a tariff, lead to more rapid economic growth?
- How does the rate of population growth influence the level of GDP per person?
- Describe two ways the U.S. government tries to encourage advances in technological knowledge.

## PROBLEMS AND APPLICATIONS

- Most countries, including the United States, import substantial amounts of goods and services from other countries. Yet the chapter says that a nation can enjoy a high standard of living only if it can produce a large quantity of goods and services itself. Can you reconcile these two facts?
- Suppose that society decided to reduce consumption and increase investment.
  - How would this change affect economic growth?
  - What groups in society would benefit from this change? What groups might be hurt?
- Societies choose what share of their resources to devote to consumption and what share to devote to investment. Some of these decisions involve private spending; others involve government spending.
  - Describe some forms of private spending that represent consumption and some forms that represent investment. The national income accounts include tuition as a part of consumer

spending. In your opinion, are the resources you devote to your education a form of consumption or a form of investment?

- Describe some forms of government spending that represent consumption and some forms that represent investment. In your opinion, should we view government spending on health programs as a form of consumption or investment? Would you distinguish between health programs for the young and health programs for the elderly?
- What is the opportunity cost of investing in capital? Do you think a country can overinvest in capital? What is the opportunity cost of investing in human capital? Do you think a country can overinvest in human capital? Explain.
- In the 1990s and the two decades of the 2000s, investors from the Asian economies of Japan and China made significant direct and portfolio investments in the United States. At the time, many

- Americans were unhappy that this investment was occurring.
- a. In what way was it better for the United States to receive this foreign investment than not to receive it?
  - b. In what way would it have been even better for Americans to have made this investment themselves?
  6. In many developing nations, young women have lower enrollment rates in secondary school than do young men. Describe several ways in which greater educational opportunities for young women could lead to faster economic growth in these countries.
  7. The International Property Right Index scores countries based on their legal and political environments and the extent to which they protect property rights. Go online and find a recent ranking. Choose three countries with high scores and three countries with low scores. Then find estimates

of GDP per person in each of these six countries. What pattern do you find? Give two possible interpretations of the pattern.

8. International data show a positive correlation between income per person and the health of the population.
  - a. Explain how higher income might cause better health outcomes.
  - b. Explain how better health outcomes might cause higher income.
  - c. How might the relative importance of your two hypotheses be relevant for public policy?
9. The great 18th-century economist Adam Smith wrote, "Little else is requisite to carry a state to the highest degree of opulence from the lowest barbarism but peace, easy taxes, and a tolerable administration of justice: all the rest being brought about by the natural course of things." Explain how each of the three conditions Smith describes promotes economic growth.

### QuickQuiz Answers

- 
1. b    2. c    3. a    4. b    5. d    6. c    7. c    8. a
-



# CHAPTER 26

## Saving, Investment, and the Financial System

**I**magine that you have just graduated from college (with a degree in economics, of course) and you decide to start your own business—an economic forecasting firm. Before you make any money selling your forecasts, you have to incur substantial costs to set up your business. You have to buy computers with which to make your forecasts, as well as desks, chairs, and filing cabinets to furnish your new office. Each of these items is a capital good that your firm will use to produce and sell its services.

How do you obtain the funds to invest in this capital? Perhaps you are able to pay for them out of your past savings. More likely, however, like most entrepreneurs, you do not have enough money of your own to finance the start of your business. As a result, you have to get the money you need from other sources.

There are various ways to finance these capital investments. You could borrow the money from a bank, friend, or relative, promising to return the money at a later date and pay interest for the use of the money. Alternatively, you could convince someone to provide the money you need for your business in exchange for a share of your future profits. In either case, your investment in computers and office equipment would be financed by someone else's saving.



**financial system**

the group of institutions in the economy that help to match one person's saving with another person's investment

The **financial system** consists of the institutions that help match one person's saving with another person's investment. As we discussed in the previous chapter, saving and investment are key ingredients to long-run economic growth: When a country saves a large portion of its GDP, more resources are available for investment in capital, and higher capital raises a country's productivity and living standard. The previous chapter, however, did not explain how the economy coordinates saving and investment. At any time, some people want to save some of their income for the future and others want to borrow to finance investments in new and growing businesses. What brings these two groups of people together? What ensures that the supply of funds from those who want to save balances the demand for funds from those who want to invest?

This chapter examines how the financial system works. First, we discuss the large variety of institutions that make up the financial system in our economy. Second, we examine the relationship between the financial system and some key macroeconomic variables—notably saving and investment. Third, we develop a model of the supply and demand for funds in financial markets. In the model, the interest rate is the price that adjusts to balance supply and demand. The model shows how various government policies affect the interest rate and, in turn, society's allocation of scarce resources.

## 26-1 Financial Institutions in the U.S. Economy

At the broadest level, the financial system moves the economy's scarce resources from savers (people who spend less than they earn) to borrowers (people who spend more than they earn). Savers save for various reasons—to put a child through college in several years or to retire comfortably in several decades. Similarly, borrowers borrow for various reasons—to buy a house to live in or to start a business to make a living. Savers supply their money to the financial system with the expectation that they will get it back with interest at a later date. Borrowers demand money from the financial system with the knowledge that they will be required to pay it back with interest at a later date.

The financial system is made up of various financial institutions that help coordinate the actions of savers and borrowers. As a prelude to analyzing the economic forces that drive the financial system, let's discuss the most important of these institutions. Financial institutions can be grouped into two categories: financial markets and financial intermediaries.

### 26-1a Financial Markets

**Financial markets** are the institutions through which a person who wants to save can directly supply funds to a person who wants to borrow. The two most important financial markets in our economy are the bond market and the stock market.

**The Bond Market** When Intel, the giant maker of computer chips, wants to borrow to finance construction of a new factory, it can borrow directly from the public. It does so by selling bonds. A **bond** is a certificate of indebtedness that specifies the obligations of the borrower to the buyer of the bond. Put simply, a bond buyer is a lender, and a bond is an IOU. The bond identifies the time at which the loan will be repaid, called the *date of maturity*, and the rate of interest that the borrower will pay periodically until the loan matures. The buyer of a bond gives his money to Intel in exchange for this promise of interest and eventual repayment

**financial markets**

financial institutions through which savers can directly provide funds to borrowers

**bond**

a certificate of indebtedness

of the amount borrowed (called the *principal*). The buyer can hold the bond until maturity, or he can sell the bond at an earlier date to someone else.

There are millions of different bonds in the U.S. economy. When large corporations, the federal government, or state and local governments need to borrow to finance the purchase of a new factory, a new jet fighter, or a new school, they usually do so by issuing bonds. If you look at *The Wall Street Journal* or the business section of your news service, you will find a listing of the prices and interest rates on some of the most important bond issues. These bonds differ according to four significant characteristics.

The first characteristic is a bond's *term*—the length of time until the bond matures. Some bonds have short terms, such as a few months, while others have terms as long as thirty years. (The British government has even issued a bond that never matures, called a *perpetuity*. This bond pays interest forever, but the principal is never repaid.) The interest rate on a bond depends, in part, on its term. Long-term bonds are riskier than short-term bonds because holders of long-term bonds have to wait longer for repayment of principal. If a holder of a long-term bond needs his money earlier than the distant date of maturity, he has no choice but to sell the bond to someone else, perhaps at a reduced price. To compensate for this risk, long-term bonds usually pay higher interest rates than short-term bonds.

The second important characteristic of a bond is its *credit risk*—the probability that the borrower will fail to pay some of the interest or principal. Such a failure to pay is called a *default*. Borrowers can (and sometimes do) default on their loans by declaring bankruptcy. When bond buyers perceive that the probability of default is high, they demand a higher interest rate as compensation for this risk. Because the U.S. government is considered to have low credit risk, U.S. government bonds tend to pay low interest rates. By contrast, financially shaky corporations raise money by issuing *junk bonds*, which pay very high interest rates. Buyers of bonds can judge credit risk by checking with various private agencies that evaluate the credit risk of different bonds. For example, Standard & Poor's rates bonds from AAA (the safest) to D (those already in default).

The third important characteristic of a bond is its *tax treatment*—the way the tax laws treat the interest earned on the bond. The interest on most bonds is taxable income; that is, the bond owner has to pay a portion of the interest he earns in income taxes. By contrast, when state and local governments issue bonds, called *municipal bonds*, the bond owners are not required to pay federal income tax on the interest income. Because of this tax advantage, bonds issued by state and local governments typically pay a lower interest rate than bonds issued by corporations or the federal government.

The fourth important characteristic of a bond is whether it offers *inflation protection*. Most bonds are written in nominal terms—that is, they promise to pay interest and principal in a specific number of dollars (or perhaps another currency). If prices rise and dollars have less purchasing power, the bondholder is worse off. Some bonds, however, index the payments of interest and principal to a measure of inflation so that when prices rise, the payments rise proportionately. Beginning in 1997, the U.S. government started issuing such bonds, called Treasury Inflation-Protected Securities (TIPS). Because TIPS offer inflation protection, they pay a lower interest rate than similar bonds without this feature.

**The Stock Market** Another way for Intel to raise funds to build a new semiconductor factory is to sell stock in the company. A share of **stock** represents ownership in a firm and is, therefore, a claim to some of the profits that the firm makes. For example, if Intel sells a total of 1,000,000 shares of stock, then each share represents ownership of 1/1,000,000 of the business.

### stock

a claim to partial ownership in a firm

The sale of stock to raise money is called *equity finance*, whereas the sale of bonds is called *debt finance*. Although corporations use both equity and debt finance to raise money for new investments, stocks and bonds are very different. The owner of shares of Intel stock is a part owner of Intel, while the owner of an Intel bond is a creditor of the corporation. If Intel is very profitable, the stockholders enjoy the benefits of these profits, whereas the bondholders get only the stated interest on their bonds. And if Intel runs into financial difficulty, the bondholders are paid what they are due before stockholders receive anything at all. Compared to bonds, stocks carry greater risk but offer potentially higher returns.

After a corporation issues stock by selling shares to the public, these shares trade among stockholders on organized stock exchanges. In these transactions, the corporation itself receives no money when its stock changes hands. The most important stock exchanges in the U.S. economy are the New York Stock Exchange and the Nasdaq (National Association of Securities Dealers Automated Quotations). Most of the world's countries have their own stock exchanges on which the shares of local companies trade, the most important being those in Tokyo, Shanghai, Hong Kong, and London.

The prices at which shares trade on stock exchanges are determined by the supply of and demand for the stock in these companies. Because stock represents ownership in a corporation, the demand for a stock (and thus its price) reflects people's perception of the corporation's future profitability. When people become optimistic about a company's future, they raise their demand for its stock and thereby bid up the price of a share of stock. Conversely, when people's expectations of a company's prospects decline, the price of a share falls.

Various stock indexes are available to monitor the overall level of stock prices. A *stock index* is computed as an average of a group of stock prices. The most famous stock index is the Dow Jones Industrial Average, which has been computed regularly since 1896. It is now based on the prices of the stocks of thirty major U.S. companies, such as Disney, Microsoft, Coca-Cola, Boeing, Apple, and Walmart. Another well-known stock index is the Standard & Poor's 500 Index, which is based on the prices of the stocks of 500 major companies. Because stock prices reflect expected profitability, these stock indexes are watched closely as possible indicators of future economic conditions.

## 26-1b Financial Intermediaries

### financial intermediaries

financial institutions through which savers can indirectly provide funds to borrowers

**Financial intermediaries** are financial institutions through which savers can indirectly provide funds to borrowers. The term *intermediary* reflects the role of these institutions in standing between savers and borrowers. Here we consider two of the most important financial intermediaries: banks and mutual funds.

**Banks** If the owner of a small grocery store wants to finance an expansion of his business, he probably proceeds differently than Intel. Unlike Intel, a small grocer would find it difficult to raise funds in the stock and bond markets. Most buyers of stocks and bonds prefer to buy those issued by larger, more familiar companies. The small grocer, therefore, most likely finances his business expansion with a loan from a local bank.

Banks are the financial intermediaries with which people are most familiar. A primary job of banks is to take in deposits from people who want to save and use these deposits to make loans to people who want to borrow. Banks pay depositors interest on their deposits and charge borrowers slightly higher interest on their loans. The difference between these rates of interest covers the banks' costs and returns some profit to the owners of the banks.

Besides being financial intermediaries, banks play another important role in the economy: They facilitate purchases of goods and services by allowing people to write checks against their deposits and to access those deposits with debit cards. In other words, banks help create a special asset that people can use as a *medium of exchange*. A medium of exchange is an item that people can easily use to engage in transactions. A bank's role in providing a medium of exchange distinguishes it from many other financial institutions. While stocks and bonds, like bank deposits, offer a possible *store of value* for the wealth that people have accumulated in past saving, they do not offer the easy, cheap, and immediate access to wealth that writing a check or swiping a debit card allows. For now, we ignore this second role of banks, but we will return to it when we discuss the monetary system later in the book.

**Mutual Funds** A financial intermediary of increasing importance in the U.S. economy is the mutual fund. A **mutual fund** is an institution that sells shares to the public and uses the proceeds to buy a selection, or *portfolio*, of various types of stocks, bonds, or both stocks and bonds. The shareholder of the mutual fund accepts all the risk and return associated with the portfolio. If the value of the portfolio rises, the shareholder benefits; if the value of the portfolio falls, the shareholder suffers the loss.

The primary advantage of mutual funds is that they allow people with small amounts of money to diversify their holdings. Because the value of any single stock or bond is tied to the fortunes of one company, holding a single kind of stock or bond is very risky. By contrast, people who hold a diverse portfolio of stocks and bonds face less risk because they have only a small stake in each company. Mutual funds make this diversification easy. With only a few hundred dollars, a person can buy shares in a mutual fund and, indirectly, become the part owner or creditor of hundreds of major companies. For this service, the company operating the mutual fund charges shareholders a fee, usually between 0.1 and 1.5 percent of assets each year.

A second advantage claimed by mutual fund companies is that mutual funds give ordinary people access to the skills of professional money managers. The managers of most mutual funds pay close attention to the developments and prospects of the companies in which they buy stock. These managers buy the stock of companies they view as having a profitable future and sell the stock of companies with less promising prospects. This professional management, it is argued, should increase the return that mutual fund depositors earn on their savings.

Financial economists, however, are often skeptical of this argument. Because thousands of money managers are paying close attention to each company's prospects, a company's stock usually trades at a price that reflects the company's true value. As a result, it is hard to "beat the market" by buying good stocks and selling

### mutual fund

an institution that sells shares to the public and uses the proceeds to buy a portfolio of stocks and bonds

#### ARLO AND JANIS by Jimmy Johnson



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bad ones. In fact, mutual funds called *index funds*, which buy all the stocks in a given stock index, perform somewhat better on average than mutual funds that take advantage of active trading by professional money managers. The explanation for the superior performance of index funds is that they keep costs low by buying and selling very rarely and by not having to pay the salaries of professional money managers.

### 26-1c Summing Up

The U.S. economy contains a large variety of financial institutions. In addition to the bond market, the stock market, banks, and mutual funds, there are also pension funds, credit unions, insurance companies, and even the local loan shark. These institutions differ in many ways. When analyzing the macroeconomic role of the financial system, however, it is more important to keep in mind that, despite their differences, these financial institutions all serve the same goal: directing the resources of savers into the hands of borrowers.

#### QuickQuiz

1. Carly wants to buy and operate an ice-cream truck but doesn't have the financial resources to start the business. She borrows \$20,000 from her friend Freddie, to whom she promises an interest rate of 7 percent, and gets another \$30,000 from her friend Sam, to whom she promises a third of her profits. What best describes this situation?
  - a. Freddie is a stockholder, and Carly is a bondholder.
  - b. Freddie is a stockholder, and Sam is a bondholder.
  - c. Sam is a stockholder, and Carly is a bondholder.
  - d. Sam is a stockholder, and Freddie is a bondholder.
2. A bond tends to pay a high interest rate if it is
  - a. a short-term bond rather than a long-term bond.
  - b. a municipal bond exempt from federal taxation.
  - c. issued by the federal government rather than a corporation.
  - d. issued by a corporation of dubious credit quality.
3. The main advantage of mutual funds is that they provide
  - a. a return insured by the government.
  - b. an easy way to hold a diversified portfolio.
  - c. an asset that is widely used as the medium of exchange.
  - d. a way to avoid fluctuations in stock and bond prices.

*Answers at end of chapter.*

## 26-2 Saving and Investment in the National Income Accounts

Events that occur within the financial system are central to developments in the overall economy. As we have just seen, the institutions that make up this system—the bond market, the stock market, banks, and mutual funds—serve the role of coordinating the economy's saving and investment. And as we saw in the previous chapter, saving and investment are important determinants of long-run growth in GDP and living standards. As a result, macroeconomists need to understand how financial markets work and how various events and policies affect them.

As a starting point for analyzing financial markets, we discuss the key macroeconomic variables that measure activity in these markets. Our emphasis here is not on behavior but on accounting. *Accounting* refers to the way in which various numbers are defined and added up. A personal accountant might help an individual add up his income and expenses. A national income accountant does the same thing for the economy as a whole. The national income accounts include, in particular, GDP and the many related statistics.

The rules of national income accounting include several important identities. Recall that an *identity* is an equation that must be true because of the way the variables in the equation are defined. Identities are useful to keep in mind because they clarify how different variables are related to one another. Here we consider some accounting identities that shed light on the macroeconomic role of financial markets.

## 26-2a Some Important Identities

Recall that gross domestic product (GDP) is both total income in an economy and the total expenditure on the economy's output of goods and services. GDP (denoted as  $Y$ ) is divided into four components of expenditure: consumption ( $C$ ), investment ( $I$ ), government purchases ( $G$ ), and net exports ( $NX$ ):

$$Y = C + I + G + NX.$$

This equation is an identity because every dollar of expenditure that shows up on the left side also shows up in one of the four components on the right side. Because of the way each of the variables is defined and measured, this equation must always hold.

In this chapter, we simplify our analysis by assuming that the economy we are examining is closed. A *closed economy* is one that does not interact with other economies. In particular, a closed economy does not engage in international trade in goods and services, and it does not engage in international borrowing and lending. Actual economies are *open economies*—that is, they interact with other economies around the world. Nonetheless, assuming a closed economy is a useful simplification with which we can learn some lessons that apply to all economies. Moreover, this assumption applies perfectly to the world economy (interplanetary trade is not yet common!).

Because a closed economy does not engage in international trade, there are no imports and exports, making net exports ( $NX$ ) exactly zero. We can simplify the identity as

$$Y = C + I + G.$$

This equation states that GDP is the sum of consumption, investment, and government purchases. Each unit of output sold in a closed economy is consumed, invested, or bought by the government.

To see what this identity can tell us about financial markets, we subtract  $C$  and  $G$  from both sides of this equation to obtain

$$Y - C - G = I.$$

The left side of this equation ( $Y - C - G$ ) is the total income in the economy that remains after paying for consumption and government purchases: This amount is called **national saving**, or just **saving**, and is denoted  $S$ . Substituting  $S$  for  $Y - C - G$ , we can write the last equation as

$$S = I.$$

This equation states that saving equals investment.

To understand the meaning of national saving, it is helpful to manipulate the definition a bit more. Let  $T$  denote the amount that the government collects from

**national saving (saving)**  
the total income in  
the economy that  
remains after paying  
for consumption and  
government purchases

households in taxes minus the amount it pays back to households in the form of transfer payments (such as Social Security and welfare). We can then write national saving in either of two ways:

$$S = Y - C - G$$

or

$$S = (Y - T - C) + (T - G).$$

These equations are the same because the two  $T$ 's in the second equation cancel each other, but each reveals a different way of thinking about national saving. In particular, the second equation separates national saving into two pieces: private saving ( $Y - T - C$ ) and public saving ( $T - G$ ).

#### **private saving**

the income that households have left after paying for taxes and consumption

#### **public saving**

the tax revenue that the government has left after paying for its spending

#### **budget surplus**

an excess of tax revenue over government spending

#### **budget deficit**

a shortfall of tax revenue from government spending

Consider each of these two pieces. **Private saving** is the amount of income that households have left after paying their taxes and paying for their consumption. In particular, because households receive income of  $Y$ , pay taxes of  $T$ , and spend  $C$  on consumption, private saving is  $Y - T - C$ . **Public saving** is the amount of tax revenue that the government has left after paying for its spending. The government receives  $T$  in tax revenue and spends  $G$  on goods and services. If  $T$  exceeds  $G$ , the government receives more money than it spends. In this case, public saving ( $T - G$ ) is positive, and the government is said to run a **budget surplus**. If  $G$  exceeds  $T$ , the government spends more than it receives in tax revenue. In this case, public saving ( $T - G$ ) is negative, and the government is said to run a **budget deficit**.

Now consider how these accounting identities are related to financial markets. The equation  $S = I$  reveals an important fact: *For the economy as a whole, saving must equal investment*. Yet this fact raises some important questions: What mechanisms lie behind this identity? What coordinates those people who are deciding how much to save and those people who are deciding how much to invest? The answer is the financial system. The bond market, the stock market, banks, mutual funds, and other financial markets and intermediaries stand between the two sides of the  $S = I$  equation. They take in the nation's saving and direct it to the nation's investment.

### 26-2b The Meaning of Saving and Investment

The terms *saving* and *investment* can sometimes be confusing. Most people use these terms casually and sometimes interchangeably. By contrast, the macroeconomists who put together the national income accounts use these terms carefully and distinctly.

Consider an example. Suppose that Larry earns more than he spends and deposits his unspent income in a bank or uses it to buy some stock or a bond from a corporation. Because Larry's income exceeds his consumption, he adds to the nation's saving. Larry might think of himself as "investing" his money, but a macroeconomist would call Larry's act saving rather than investment.

In the language of macroeconomics, investment refers to the purchase of new capital, such as equipment or buildings. When Moe borrows from the bank to build himself a new house, he adds to the nation's investment. (Remember, the purchase of a new house is the one form of household spending that is investment rather than consumption.) Similarly, when the Curly Corporation sells some stock and uses the proceeds to build a new factory, it also adds to the nation's investment.

Although the accounting identity  $S = I$  shows that saving and investment are equal for the economy as a whole, it does not mean that saving and investment

are equal for every individual household or firm. Larry's saving can be greater than his investment, and he can deposit the excess in a bank. Moe's saving can be less than his investment, and he can borrow the shortfall from a bank. Banks and other financial institutions make these individual differences between saving and investment possible by allowing one person's saving to finance another person's investment.

### QuickQuiz

4. If the government collects more in tax revenue than it spends, and households consume more than they get in after-tax income, then
  - a. private saving and public saving are both positive.
  - b. private saving and public saving are both negative.
  - c. private saving is positive, but public saving is negative.
  - d. private saving is negative, but public saving is positive.
5. A closed economy has income of \$1,000, government spending of \$200, taxes of \$150, and investment of \$250. What is private saving?
  - a. \$100
  - b. \$200
  - c. \$300
  - d. \$400

*Answers at end of chapter.*

## 26-3 The Market for Loanable Funds

Having discussed some of the important financial institutions in our economy and the macroeconomic role of these institutions, we are ready to build a model of financial markets. Our purpose in building this model is to explain how financial markets coordinate an economy's saving and investment. The model also gives us a tool with which we can analyze various government policies that influence saving and investment.

To keep things simple, we assume that the economy has only one financial market, called the **market for loanable funds**. All savers go to this market to deposit their saving, and all borrowers go to this market to take out their loans. Thus, the term *loanable funds* refers to all income that people have chosen to save and lend out, rather than use for their own consumption, and to the amount that investors have chosen to borrow to fund new investment projects. In the market for loanable funds, there is one interest rate, which is both the return to saving and the cost of borrowing.

The assumption of a single financial market, of course, is not realistic. As we have seen, the economy has many types of financial institutions. But as we discussed in Chapter 2, the art in building an economic model is simplifying the world in order to explain it. For our purposes here, we can ignore the diversity of financial institutions and assume that the economy has a single financial market.

**market for loanable funds**  
the market in which those who want to save supply funds and those who want to borrow to invest demand funds

### 26-3a Supply and Demand for Loanable Funds

The economy's market for loanable funds, like other markets in the economy, is governed by supply and demand. To understand how the market for loanable funds operates, therefore, we first look at the sources of supply and demand in that market.

The supply of loanable funds comes from people who have some extra income they want to save and lend out. This lending can occur directly, such as when

a household buys a bond from a firm, or it can occur indirectly, such as when a household makes a deposit in a bank, which then uses the funds to make loans. In both cases, *saving is the source of the supply of loanable funds*.

The demand for loanable funds comes from households and firms who wish to borrow to make investments. This demand includes families taking out mortgages to buy new homes. It also includes firms borrowing to buy new equipment or build factories. In both cases, *investment is the source of the demand for loanable funds*.

The interest rate is the price of a loan. It represents the amount that borrowers pay for loans and the amount that lenders receive on their saving. Because a high interest rate makes borrowing more expensive, the quantity of loanable funds demanded falls as the interest rate rises. Similarly, because a high interest rate makes saving more attractive, the quantity of loanable funds supplied rises as the interest rate rises. In other words, the demand curve for loanable funds slopes downward, and the supply curve for loanable funds slopes upward.

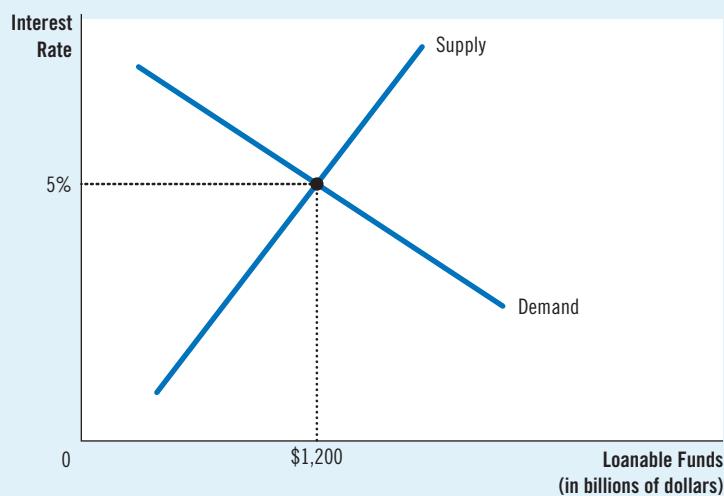
Figure 1 shows the interest rate that balances the supply and demand for loanable funds. In the equilibrium shown, the interest rate is 5 percent, and the quantity of loanable funds demanded and the quantity of loanable funds supplied both equal \$1,200 billion.

The adjustment of the interest rate to the equilibrium level occurs for the usual reasons. If the interest rate were lower than the equilibrium level, the quantity of loanable funds supplied would be less than the quantity of loanable funds demanded. The resulting shortage of loanable funds would encourage lenders to raise the interest rate they charge. A higher interest rate would encourage saving (thereby increasing the quantity of loanable funds supplied) and discourage borrowing for investment (thereby decreasing the quantity of loanable funds demanded). Conversely, if the interest rate were higher than the equilibrium level, the quantity of loanable funds supplied would exceed the quantity of loanable funds demanded. As lenders compete for the scarce borrowers, interest rates would be driven down. In this way, the interest rate approaches the equilibrium level at which the supply and demand for loanable funds exactly balance.

**FIGURE 1**

#### The Market for Loanable Funds

The interest rate in the economy adjusts to balance the supply and demand for loanable funds. The supply of loanable funds comes from national saving, including both private saving and public saving. The demand for loanable funds comes from firms and households that want to borrow for purposes of investment. Here the equilibrium interest rate is 5 percent, and \$1,200 billion of loanable funds are supplied and demanded.



Recall that economists distinguish between the real interest rate and the nominal interest rate. The nominal interest rate is the monetary return to saving and the monetary cost of borrowing. It is the interest rate as usually reported. The real interest rate is the nominal interest rate corrected for inflation; it equals the nominal interest rate minus the inflation rate. Because inflation erodes the value of money over time, the real interest rate more accurately reflects the real return to saving and the real cost of borrowing. Therefore, the supply and demand for loanable funds depend on the real (rather than nominal) interest rate, and the equilibrium in Figure 1 should be interpreted as determining the real interest rate in the economy. For the rest of this chapter, when you see the term *interest rate*, you should remember that we are talking about the real interest rate.

This model of the supply and demand for loanable funds shows that financial markets work much like other markets in the economy. In the market for milk, for instance, the price of milk adjusts so that the quantity of milk supplied balances the quantity of milk demanded. In this way, the invisible hand coordinates the behavior of dairy farmers and the behavior of milk drinkers. Once we realize that saving represents the supply of loanable funds and investment represents the demand, we can see how the invisible hand coordinates saving and investment. When the interest rate adjusts to balance supply and demand in the market for loanable funds, it coordinates the behavior of people who want to save (the suppliers of loanable funds) and the behavior of people who want to invest (the demanders of loanable funds).

We can now use this model of the market for loanable funds to examine various government policies that affect the economy's saving and investment. Because the model is just supply and demand in a particular market, we analyze the effects of a policy using the three steps discussed in Chapter 4. First, we decide whether the policy shifts the supply curve or the demand curve. Second, we determine the direction of the shift. Third, we use the supply-and-demand diagram to see how the equilibrium changes.

### 26-3b Policy 1: Saving Incentives

Many economists and policymakers have advocated increases in saving. Their argument is simple. One of the *Ten Principles of Economics* in Chapter 1 is that a country's standard of living depends on its ability to produce goods and services. And as we discussed in the preceding chapter, saving is an important long-run determinant of a nation's productivity. If the United States could somehow raise its saving rate, more resources would be available for capital accumulation, GDP would grow more rapidly, and over time, U.S. citizens would enjoy a higher standard of living.

Another of the *Ten Principles of Economics* is that people respond to incentives. Many economists have used this principle to suggest that the low rate of saving is at least partly attributable to tax laws that discourage saving. The U.S. federal government, as well as many state governments, collects revenue by taxing income, including interest and dividend income. To see the effects of this policy, consider a 25-year-old who saves \$1,000 and buys a 30-year bond that pays an interest rate of 9 percent. In the absence of taxes, the \$1,000 grows to \$13,268 when the individual reaches age 55. But if the interest income is taxed at a rate of, say, 33 percent, the after-tax interest rate is only 6 percent. In this case, the \$1,000 grows to only \$5,743 over the 30 years. The tax on interest income substantially reduces the future payoff from current saving and, as a result, reduces the incentive for people to save.

In response to this problem, some economists and lawmakers have proposed reforming the tax code to encourage greater saving. For example, one proposal is to expand eligibility for special accounts, such as Individual Retirement Accounts, that allow people to shelter some of their saving from taxation. Let's consider the effect of such a saving incentive on the market for loanable funds, as illustrated in Figure 2. We analyze this policy following our three steps.

First, which curve would this policy affect? Because the tax change would alter the incentive for households to save *at any given interest rate*, it would affect the quantity of loanable funds supplied at each interest rate. Thus, the supply of loanable funds would shift. The demand for loanable funds would remain the same because the tax change would not directly affect the amount that borrowers want to borrow at any given interest rate.

Second, which way would the supply curve shift? Because saving would be taxed less heavily than under current law, households would increase their saving by consuming a smaller fraction of their income. Households would use this additional saving to increase their deposits in banks or to buy more bonds. The supply of loanable funds would increase, and the supply curve would shift to the right from  $S_1$  to  $S_2$ , as shown in Figure 2.

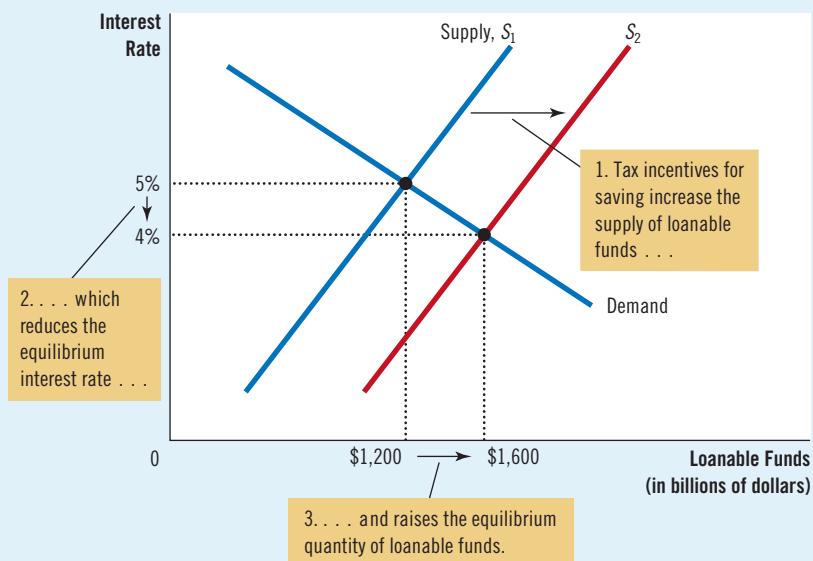
Finally, we can compare the old and new equilibria. In the figure, the increased supply of loanable funds reduces the interest rate from 5 percent to 4 percent. The lower interest rate raises the quantity of loanable funds demanded from \$1,200 billion to \$1,600 billion. That is, the shift in the supply curve moves the market equilibrium along the demand curve. With a lower cost of borrowing, households and firms are motivated to borrow more to finance greater investment. Thus, *if a reform of the tax laws encouraged greater saving, the result would be lower interest rates and greater investment.*

This analysis of the effects of increased saving is widely accepted among economists, but there is less consensus about what kinds of tax changes should be enacted. Many economists endorse tax reform aimed at increasing saving to

**FIGURE 2**

### Saving Incentives Increase the Supply of Loanable Funds

A change in the tax laws to encourage Americans to save more would shift the supply of loanable funds to the right from  $S_1$  to  $S_2$ . As a result, the equilibrium interest rate would fall, and the lower interest rate would stimulate investment. Here the equilibrium interest rate falls from 5 percent to 4 percent, and the equilibrium quantity of loanable funds saved and invested rises from \$1,200 billion to \$1,600 billion.



stimulate investment and growth. Yet others are skeptical that these tax changes would have much effect on national saving. These skeptics also doubt the equity of the proposed reforms. They argue that, in many cases, the benefits of the tax changes would accrue primarily to the wealthy, who are least in need of tax relief.

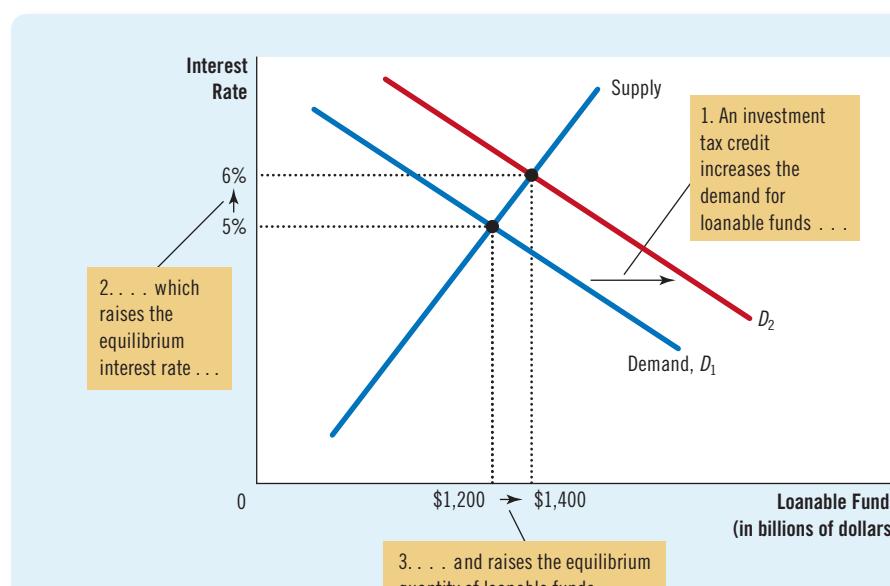
### 26-3c Policy 2: Investment Incentives

Suppose that Congress passed a tax reform aimed at making investment more attractive—for instance, by instituting an *investment tax credit*, as Congress has done from time to time. An investment tax credit gives a tax advantage to any firm building a new factory or buying a new piece of equipment. Let's consider the effect of such a tax reform on the market for loanable funds, as illustrated in Figure 3.

First, would the tax credit affect supply or demand? Because it would reward firms that borrow and invest in new capital, it would alter investment at any given interest rate and, thereby, change the demand for loanable funds. By contrast, because the tax credit would not affect the amount that households save at any given interest rate, it would not affect the supply of loanable funds.

Second, which way would the demand curve shift? Because firms would have an incentive to increase investment at any interest rate, the quantity of loanable funds demanded would be higher at any given interest rate. Thus, the demand curve for loanable funds would move to the right, as shown by the shift from  $D_1$  to  $D_2$  in the figure.

Third, consider how the equilibrium would change. In Figure 3, the increased demand for loanable funds raises the interest rate from 5 percent to 6 percent, and the higher interest rate in turn increases the quantity of loanable funds supplied from \$1,200 billion to \$1,400 billion, as households respond by increasing the amount they save. This change in household behavior is represented here as a movement along the supply curve. Thus, *if a reform of the tax laws encouraged greater investment, the result would be higher interest rates and greater saving.*



**FIGURE 3**

#### Investment Incentives Increase the Demand for Loanable Funds

If the passage of an investment tax credit encouraged firms to invest more, the demand for loanable funds would increase. As a result, the equilibrium interest rate would rise, and the higher interest rate would stimulate saving. Here, when the demand curve shifts from  $D_1$  to  $D_2$ , the equilibrium interest rate rises from 5 percent to 6 percent, and the equilibrium quantity of loanable funds saved and invested rises from \$1,200 billion to \$1,400 billion.

### 26-3d Policy 3: Government Budget Deficits and Surpluses

A perpetual topic of political debate is the status of the government budget. Recall that a *budget deficit* is an excess of government spending over tax revenue. Governments finance budget deficits by borrowing in the bond market, and the accumulation of past government borrowing is called the *government debt*. A *budget surplus*, an excess of tax revenue over government spending, can be used to repay some of the government debt. If government spending exactly equals tax revenue, the government is said to have a *balanced budget*.

Imagine that the government starts with a balanced budget and then, because of an increase in government spending, starts running a budget deficit. We can analyze the effects of the budget deficit by following our three steps in the market for loanable funds, as illustrated in Figure 4.

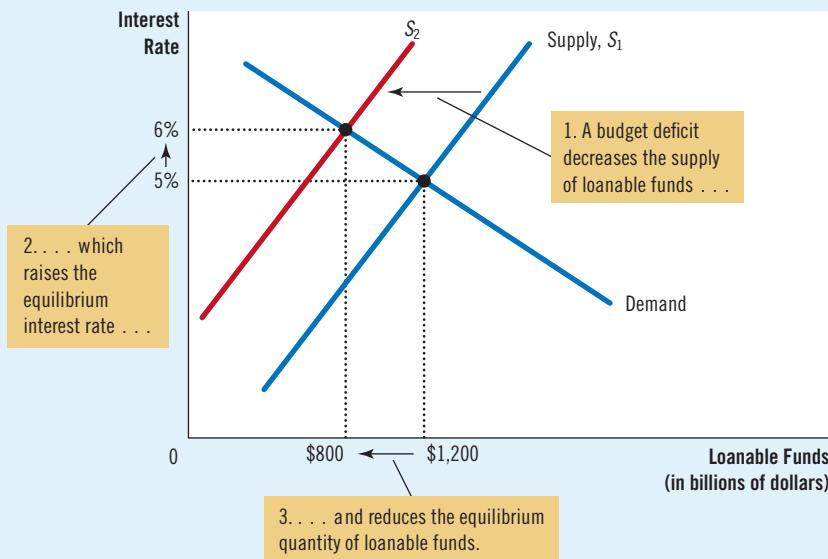
First, which curve shifts when the government starts running a budget deficit? Recall that national saving—the source of the supply of loanable funds—is composed of private saving and public saving. A change in the government budget balance represents a change in public saving and, therefore, in the supply of loanable funds. Because the budget deficit does not influence the amount that households and firms want to borrow to finance investment at any given interest rate, it does not alter the demand for loanable funds.

Second, which way does the supply curve shift? When the government runs a budget deficit, public saving is negative, so national saving declines. In other words, when the government borrows to finance its budget deficit, it reduces the supply of loanable funds available to finance investment by households and firms. Thus, a budget deficit shifts the supply curve for loanable funds to the left from  $S_1$  to  $S_2$ , as shown in Figure 4.

**FIGURE 4**

#### The Effect of a Government Budget Deficit

When the government spends more than it receives in tax revenue, the resulting budget deficit lowers national saving. The supply of loanable funds decreases, and the equilibrium interest rate rises. Thus, when the government borrows to finance its budget deficit, it crowds out households and firms that otherwise would borrow to finance investment. Here, when the supply curve shifts from  $S_1$  to  $S_2$ , the equilibrium interest rate rises from 5 percent to 6 percent, and the equilibrium quantity of loanable funds saved and invested falls from \$1,200 billion to \$800 billion.



Third, we can compare the old and new equilibria. In the figure, when the budget deficit reduces the supply of loanable funds, the interest rate rises from 5 percent to 6 percent. The quantity of loanable funds demanded then decreases from \$1,200 billion to \$800 billion as the higher interest rate discourages many demanders of loanable funds. Fewer families buy new homes, and fewer firms choose to build new factories. The fall in investment due to government borrowing is represented by the movement along the demand curve and is called **crowding out**. That is, when the government borrows to finance its budget deficit, it crowds out private borrowers who are trying to finance investment.

Thus, the most basic lesson about budget deficits follows directly from their effects on the supply and demand for loanable funds: *When the government reduces national saving by running a budget deficit, the interest rate rises and investment falls.* Because investment is important for long-run economic growth, government budget deficits reduce the economy's growth rate.

Why, you might ask, does a budget deficit affect the supply of loanable funds, rather than the demand for them? After all, the government finances a budget deficit by selling bonds, thereby borrowing from the private sector. Why does increased borrowing by the government shift the supply curve, whereas increased borrowing by private investors shifts the demand curve? To answer this question, we need to examine more precisely the meaning of "loanable funds." The model as presented here takes this term to mean the *flow of resources available to fund private investment*; thus, a government budget deficit reduces the supply of loanable funds. If, instead, we had defined the term "loanable funds" to mean the *flow of resources available from private saving*, then the government budget deficit would increase demand rather than reduce supply. Changing the interpretation of the term would cause a semantic change in how we described the model, but the upshot of the analysis would be the same: In either case, a budget deficit increases the interest rate, thereby crowding out private borrowers who are relying on financial markets to fund private investment projects.

So far, we have examined a budget deficit that results from an increase in government spending, but a budget deficit that results from a tax cut has similar effects. A tax cut reduces tax revenue  $T$  and thus public saving,  $T - G$ . Private saving,  $Y - T - C$ , might increase because of lower  $T$ , but as long as households respond to the lower taxes by consuming more,  $C$  increases, so private saving rises by less than public saving declines. Thus, national saving ( $S = Y - C - G$ ), the sum of public saving and private saving, declines. Once again, the budget deficit reduces the supply of loanable funds, drives up the interest rate, and crowds out borrowers trying to finance capital investments.

Now that we understand the impact of budget deficits, we can turn the analysis around and see that government budget surpluses have the opposite effects. When the government collects more in tax revenue than it spends, it saves the difference by retiring some of the outstanding government debt. This budget surplus, or public saving, contributes to national saving. Thus, *a budget surplus increases the supply of loanable funds, reduces the interest rate, and stimulates investment.* Higher investment, in turn, means greater capital accumulation and more rapid economic growth.

### **crowding out**

a decrease in investment that results from government borrowing

ASK THE  
EXPERTS

## Fiscal Policy and Saving

"Sustained tax and spending policies that boost consumption in ways that reduce the saving rate are likely to lower long-run living standards."

**What do economists say?**

79% agree
21% uncertain
0% disagree

Source: IGM Economic Experts Panel, July 8, 2013.



### THE HISTORY OF U.S. GOVERNMENT DEBT

How indebted is the U.S. government? The answer to this question varies substantially over time. Figure 5 shows the debt of the U.S. federal government expressed as a percentage of U.S. GDP.

It shows that the government debt has fluctuated from zero in 1836 to 107 percent of GDP in 1945.

The debt-to-GDP ratio is one gauge of the government's finances. Because GDP is a rough measure of the government's tax base, a declining debt-to-GDP ratio indicates that the government indebtedness is shrinking relative to its ability to raise tax revenue. This suggests that the government is, in some sense, living within its means. By contrast, a rising debt-to-GDP ratio means that the government indebtedness is increasing relative to its ability to raise tax revenue. It is often interpreted as meaning that fiscal policy—government spending and taxes—cannot be sustained forever at current levels.

Throughout history, the primary cause of fluctuations in government debt has been war. When wars occur, government spending on national defense rises substantially to pay for soldiers and military equipment. Taxes sometimes rise as well but typically by much less than the increase in spending. The result is a budget

**FIGURE 5**

#### The U.S. Government Debt

The debt of the U.S. federal government, expressed here as a percentage of GDP, has varied throughout history. Wartime spending is typically associated with substantial increases in government debt.

**Source:** U.S. Department of Treasury; U.S. Department of Commerce; and T. S. Berry, "Production and Population since 1789," Bostwick Paper No. 6, Richmond, 1988.



deficit and increasing government debt. When the war is over, government spending declines and the debt-to-GDP ratio starts declining as well.

There are two reasons to believe that debt financing of war is an appropriate policy. First, it allows the government to keep tax rates smooth over time. Without debt financing, wars would require sharp increases in tax rates, which would cause a substantial decline in economic efficiency. Second, debt financing of wars shifts part of the cost of wars to future generations, who will have to pay off the government debt. Putting some of the tax burden on future generations is arguably fair given that they get some of the benefit when a previous generation fights a war to defend the nation from foreign aggressors.

One large increase in government debt that cannot be explained by war is the increase that occurred beginning around 1980. When President Ronald Reagan took office in 1981, he was committed to smaller government and lower taxes. Yet he found cutting government spending to be more difficult politically than cutting taxes. The result was the beginning of a period of large budget deficits that continued not only through Reagan's time in office but also for many years thereafter. As a result, government debt rose from 26 percent of GDP in 1980 to 48 percent of GDP in 1993.

Because government budget deficits reduce national saving, investment, and long-run economic growth, the rise in government debt during the 1980s troubled many economists and policymakers. When Bill Clinton moved into the Oval Office in 1993, deficit reduction was his first major goal. Similarly, when the Republicans took control of Congress in 1995, deficit reduction was high on their legislative agenda. Both of these efforts substantially reduced the size of the government budget deficit. In addition, a booming economy in the late 1990s brought in even more tax revenue. Eventually, the federal budget turned from deficit to surplus, and the debt-to-GDP ratio declined significantly for several years.

This fall in the debt-to-GDP ratio, however, stopped during the presidency of George W. Bush, as the budget surplus turned back into a budget deficit. There were three main reasons for this change. First, President Bush signed into law several major tax cuts, which he had promised during the 2000 presidential campaign. Second, in 2001, the economy experienced a *recession* (a reduction in economic activity), which automatically decreased tax revenue and increased government spending. Third, there were increases in government spending on homeland security following the September 11, 2001 attacks and on the subsequent wars in Iraq and Afghanistan.

Truly dramatic increases in the debt-to-GDP ratio started occurring in 2008, as the economy experienced a financial crisis and a deep recession. (The accompanying FYI box addresses this topic briefly, but we will study it more fully in coming chapters.) The recession automatically increased the budget deficit, and several policy measures enacted during the Bush and Obama administrations aimed at combating the recession reduced tax revenue and increased government spending even more. From 2009 to 2012, the federal government's budget deficit averaged about 9 percent of GDP, levels not seen since World War II. The borrowing to finance these deficits led to an increase in the debt-to-GDP ratio from 39 percent in 2008 to 70 percent in 2012.

After 2012, as the economy recovered, the budget deficits shrank, and the debt-to-GDP ratio stabilized. But many budget analysts are concerned about increases in the debt-to-GDP ratio going forward. One reason is that President Trump enacted a significant tax cut beginning in 2018. More important, as members of the large baby-boom generation reach retirement age, they will become eligible for Social Security and Medicare benefits, putting upward pressure on government spending. Without sizable increases in tax revenue or cuts in government spending, the U.S. federal government will likely experience a rising debt-to-GDP ratio over the next few decades. ●

**FYI****Financial Crises**

In 2008 and 2009, the U.S. economy and many other major economies around the world experienced a financial crisis, which in turn led to a deep downturn in economic activity. We will examine these events in detail later in this book. But because this chapter introduces the financial system, let's discuss briefly the key elements of financial crises.

The first element of a financial crisis is a large decline in the prices of some assets. In 2008 and 2009, that asset was real estate. House prices, after experiencing a boom earlier in the decade, fell by about 30 percent over just a few years. Such a large decline in real estate prices had not been seen in the United States since the 1930s.

The second element of a financial crisis is widespread insolvencies at financial institutions. (A company is *insolvent* when its liabilities exceed the value of its assets.) In 2008 and 2009, many banks and other financial firms had in effect placed bets on house prices by holding mortgages backed by that real estate. When house prices fell, large numbers of homeowners stopped repaying their loans. These defaults pushed several major financial institutions toward bankruptcy.

The third element of a financial crisis is a decline in confidence in financial institutions. Although some deposits in banks are insured by government policies, not all are. As insolvencies mounted in 2008 and 2009, every financial institution became a candidate for the next bankruptcy. Individuals and firms with uninsured deposits in those institutions

pulled out their money. Needing cash to pay back those depositors, banks started selling off assets (sometimes at reduced "fire-sale" prices) and cut back on new lending.

The fourth element of a financial crisis is a credit crunch. With many financial institutions facing difficulties, prospective borrowers had trouble getting loans, even if they had profitable investment projects. In essence, the financial system had trouble performing its normal function of directing the resources of savers into the hands of borrowers with the best investment opportunities.

The fifth element of a financial crisis is an economic downturn. With people unable to obtain financing for new investment projects, the overall demand for goods and services declined. As a result, for reasons we discuss more fully later in the book, national income fell and unemployment rose.

The sixth and final element of a financial crisis is a vicious circle. The economic downturn reduced the profitability of many companies and the value of many assets. Thus, we started over again at step one, and the problems in the financial system and the economic downturn reinforced each other.

Financial crises, such as the one of 2008 and 2009, can have severe consequences. Fortunately, they do end. Financial institutions eventually get back on their feet, perhaps with some help from government policy, and they return to their normal function of financial intermediation. ■

**QuickQuiz**

6. If a popular TV show on personal finance convinces Americans to save more for retirement, the \_\_\_\_\_ curve for loanable funds would shift, driving the equilibrium interest rate \_\_\_\_\_.  
 a. supply; up  
 b. supply; down  
 c. demand; up  
 d. demand; down
7. If the business community becomes more optimistic about the profitability of capital, the \_\_\_\_\_ curve for loanable funds would shift, driving the equilibrium interest rate \_\_\_\_\_.  
 a. supply; up  
 b. supply; down  
 c. demand; up  
 d. demand; down
8. Which of the following policy actions would unambiguously reduce the supply of loanable funds and crowd out investment?  
 a. an increase in taxes and a decrease in government spending  
 b. a decrease in taxes together with an increase in government spending  
 c. an increase in both taxes and government spending  
 d. a decrease in both taxes and government spending
9. From 2008 to 2012, in the aftermath of the financial crisis, the ratio of government debt to GDP in the United States  
 a. increased markedly.  
 b. decreased markedly.  
 c. was stable at a historically high level.  
 d. was stable at a historically low level.

*Answers at end of chapter.*

## 26-4 Conclusion

"Neither a borrower nor a lender be," Polonius advises his son in Shakespeare's *Hamlet*. If everyone followed Polonius's advice, this chapter would be unnecessary.

But few do. In our economy, people borrow and lend often, and usually for good reason. You may borrow one day to start your own business or to buy a home. And people may lend to you in the hope that the interest you pay will allow them to enjoy a more prosperous retirement. The financial system's job is to coordinate all this borrowing and lending activity.

In many ways, financial markets are like other markets in the economy. The price of loanable funds—the interest rate—is governed by the forces of supply and demand, just as other prices in the economy are. And we can analyze shifts in supply or demand in financial markets as we do in other markets. One of the *Ten Principles of Economics* in Chapter 1 is that markets are usually a good way to organize economic activity. This principle applies to financial markets as well. When financial markets bring the supply and demand for loanable funds into balance, they help allocate the economy's scarce resources to their most efficient uses.

In one way, however, financial markets are special. Financial markets, unlike most other markets, serve the important role of linking the present and the future. Those who supply loanable funds—savers—do so because they want to convert some of their current income into future purchasing power. Those who demand loanable funds—borrowers—do so because they want to invest today and use the capital to produce goods and services in the future. Thus, well-functioning financial markets are important not only for current generations but also for future generations who will inherit many of the resulting benefits.

### CHAPTER IN A NUTSHELL

- The U.S. financial system is made up of many types of financial institutions, such as the bond market, the stock market, banks, and mutual funds. All these institutions direct the resources of households that want to save some of their income into the hands of households and firms that want to borrow.
- National income accounting identities reveal some important relationships among macroeconomic variables. In particular, for a closed economy, national saving must equal investment. Financial institutions are the mechanism through which the economy matches one person's saving with another person's investment.
- The interest rate is determined by the supply and demand for loanable funds. The supply of loanable funds comes from households that want to save some of their income and lend it out. The demand for loanable funds comes from households and firms that want to borrow for investment. To analyze how any policy or event affects the interest rate, one must consider how it affects the supply and demand for loanable funds.
- National saving equals private saving plus public saving. A government budget deficit represents negative public saving and, therefore, reduces national saving and the supply of loanable funds available to finance investment. When a government budget deficit crowds out investment, it reduces the growth of productivity and GDP.

### KEY CONCEPTS

financial system, p. 530

financial markets, p. 530

bond, p. 530

stock, p. 531

financial intermediaries, p. 532

mutual fund, p. 533

national saving (saving), p. 535

private saving, p. 536

public saving, p. 536

budget surplus, p. 536

budget deficit, p. 536

market for loanable funds, p. 537

crowding out, p. 543

## QUESTIONS FOR REVIEW

- What is the role of the financial system? Name and describe two markets that are part of the financial system in the U.S. economy. Name and describe two financial intermediaries.
- Why is it important for people who own stocks and bonds to diversify their holdings? What type of financial institution makes diversification easier?
- What is national saving? What is private saving? What is public saving? How are these three variables related?
- What is investment? How is it related to national saving in a closed economy?
- Describe a change in the tax code that might increase private saving. If this policy were implemented, how would it affect the market for loanable funds?
- What is a government budget deficit? How does it affect interest rates, investment, and economic growth?

## PROBLEMS AND APPLICATIONS

- For each of the following pairs, which bond would you expect to pay a higher interest rate? Explain.
  - a bond of the U.S. government or a bond of an Eastern European government
  - a bond that repays the principal in year 2020 or a bond that repays the principal in year 2040
  - a bond from Coca-Cola or a bond from a software company you run in your garage
  - a bond issued by the federal government or a bond issued by New York State
- Many workers hold large amounts of stock issued by the firms at which they work. Why do you suppose companies encourage this behavior? Why might a person *not* want to hold stock in the company where he works?
- Explain the difference between saving and investment as defined by a macroeconomist. Which of the following situations represent investment and which represent saving? Explain.
  - Your family takes out a mortgage and buys a new house.
  - You use your \$200 paycheck to buy stock in AT&T.
  - Your roommate earns \$100 and deposits it in his account at a bank.
  - You borrow \$1,000 from a bank to buy a car to use in your pizza delivery business.
- Suppose GDP is \$8 trillion, taxes are \$1.5 trillion, private saving is \$0.5 trillion, and public saving is \$0.2 trillion. Assuming this economy is closed, calculate consumption, government purchases, national saving, and investment.
- Economists in Funlandia, a closed economy, have collected the following information about the economy for a particular year:

$$Y = 10,000$$

$$C = 6,000$$

$$T = 1,500$$

$$G = 1,700$$

The economists also estimate that the investment function is:

$$I = 3,300 - 100r,$$

where  $r$  is the country's real interest rate, expressed as a percentage. Calculate private saving, public saving, national saving, investment, and the equilibrium real interest rate.

- Suppose that Intel is considering building a new chip-making factory.
  - Assuming that Intel needs to borrow money in the bond market, why would an increase in interest rates affect Intel's decision about whether to build the factory?
  - If Intel has enough of its own funds to finance the new factory without borrowing, would an increase in interest rates still affect Intel's decision about whether to build the factory? Explain.
- Three students have each saved \$1,000. Each has an investment opportunity in which he or she can invest up to \$2,000. Here are the rates of return on the students' investment projects:

Harry	5 percent
Ron	8 percent
Hermione	20 percent

- If borrowing and lending are prohibited, so each student can use only personal saving to finance his or her own investment project, how much will each student have a year later when the project pays its return?
  - Now suppose their school opens up a market for loanable funds in which students can borrow and lend among themselves at an interest rate  $r$ . What would determine whether a student would choose to be a borrower or lender in this market?

- c. Among these three students, what would be the quantity of loanable funds supplied and quantity demanded at an interest rate of 7 percent? At 10 percent?
- d. At what interest rate would the loanable funds market among these three students be in equilibrium? At this interest rate, which student(s) would borrow and which student(s) would lend?
- e. At the equilibrium interest rate, how much does each student have a year later after the investment projects pay their return and loans have been repaid? Compare your answers to those you gave in part (a). Who benefits from the existence of the loanable funds market—the borrowers or the lenders? Is anyone worse off?
8. Suppose the government borrows \$20 billion more next year than this year.
- Use a supply-and-demand diagram to analyze this policy. Does the interest rate rise or fall?
  - What happens to investment? To private saving? To public saving? To national saving? Compare the size of the changes to the \$20 billion of extra government borrowing.
9. This chapter explains that investment can be increased both by reducing taxes on private saving and by reducing the government budget deficit.
- Why is it difficult to implement both of these policies at the same time?
  - What would you need to know about private saving to determine which of these two policies would be the more effective way to raise investment?

### QuickQuiz Answers

1. d    2. d    3. b    4. d    5. c    6. b    7. c    8. b    9. a



# CHAPTER 27

## The Basic Tools of Finance

**A**t some point in your life, you will interact with the economy's financial system. You will deposit your savings in a bank account, or you will take out a loan to cover tuition or buy a house. After you have a job, your employer will start a retirement account for you, and you will decide whether to invest the funds in stocks, bonds, or other financial instruments. If you try to put together your own portfolio, you will have to decide between investing in established companies such as Coca-Cola or newer ones such as Twitter. And in the media, you will hear reports about whether the stock market is up or down, along with the often feeble attempts to explain why the market behaves as it does.

In almost all of the financial decisions you will make during your life, you will encounter two related elements: time and risk. As we saw in the preceding two chapters, the financial system coordinates the economy's saving and investment, which are crucial determinants of economic growth. Most fundamentally, the financial system concerns decisions and actions we undertake today that will affect our lives in the future. But the future is unknown. When a person decides to allocate some saving, or a firm decides to undertake an investment, the decision is based on a guess about the likely result. The actual result, however, could end up being very different from what was expected.



**finance**

the field that studies how people make decisions regarding the allocation of resources over time and the handling of risk

This chapter introduces some tools that help us understand the decisions that people make as they participate in financial markets. The field of **finance** develops these tools in great detail, and you may choose to take courses that focus on this topic. But because the financial system is so important to the functioning of the economy, many of the basic insights of finance are central to understanding how the economy works. The tools of finance can also help you think through some of the decisions that you will make in your own life.

This chapter takes up three topics. First, we discuss how to compare sums of money at different points in time. Second, we discuss how to manage risk. Third, we build on our analysis of time and risk to examine what determines the value of an asset, such as a share of stock.

## 27-1 Present Value: Measuring the Time Value of Money

Imagine that someone offers to give you \$100 today or \$100 in 10 years. Which would you choose? This is an easy question. Getting \$100 today is better because you can deposit the money in a bank, still have it in 10 years, and earn interest on the \$100 along the way. The lesson: Money today is more valuable than the same amount of money in the future.

Now consider a harder question: Imagine that someone offers you \$100 today or \$200 in 10 years. Which would you choose? To answer this question, you need some way to compare sums of money from different points in time. Economists do this with a concept called present value. The **present value** of any future sum of money is the amount of money that, given current interest rates, would be needed today to produce that future sum.

To learn how to use the concept of present value, let's work through a couple of simple examples:

*Question:* If you put \$100 in a bank account today, how much will it be worth in  $N$  years? That is, what will be the **future value** of this \$100?

*Answer:* Let's use  $r$  to denote the interest rate expressed in decimal form (so an interest rate of 5 percent means  $r = 0.05$ ). Suppose that interest is paid annually and that it remains in the bank account to earn more interest—a process called **compounding**. Then the \$100 will become

$$\begin{aligned} (1 + r) \times \$100 &\quad \text{after 1 year,} \\ (1 + r) \times (1 + r) \times \$100 = (1 + r)^2 \times \$100 &\quad \text{after 2 years,} \\ (1 + r) \times (1 + r) \times (1 + r) \times \$100 = (1 + r)^3 \times \$100 &\quad \text{after 3 years, ...} \\ (1 + r)^N \times \$100 &\quad \text{after } N \text{ years.} \end{aligned}$$

For example, if we invest at an interest rate of 5 percent for 10 years, then the future value of the \$100 will be  $(1.05)^{10} \times \$100$ , or \$163.

*Question:* Now suppose you are going to be paid \$200 in  $N$  years. What is the **present value** of this future payment? That is, how much would you have to deposit in a bank right now to yield \$200 in  $N$  years?

*Answer:* To answer this question, just turn the previous answer on its head. In the last question, we computed a future value from a present value by *multiplying* by the factor  $(1 + r)^N$ . To compute a present value from a future value, we *divide*

by the factor  $(1 + r)^N$ . Thus, the present value of \$200 to be paid in  $N$  years is  $\$200/(1 + r)^N$ . If that amount is deposited in a bank today, after  $N$  years it will become  $(1 + r)^N \times [\$200/(1 + r)^N]$ , which equals \$200. For instance, if the interest rate is 5 percent, the present value of \$200 to be paid in 10 years is  $\$200/(1.05)^{10}$ , or \$123. This means that \$123 deposited today in a bank account earning 5 percent interest would be worth \$200 after 10 years.

This illustrates the general formula:

- If  $r$  is the interest rate, then an amount  $X$  to be received in  $N$  years has a present value of  $X/(1 + r)^N$ .

Because the possibility of earning interest reduces the present value below the amount  $X$ , the process of finding a present value of a future sum of money is called *discounting*. This formula shows precisely how much future sums should be discounted.

Let's now return to our earlier question: Should you choose \$100 today or \$200 in 10 years? Based on our calculation of present value using an interest rate of 5 percent, you should prefer the \$200 in 10 years. The future \$200 has a present value of \$123, which is greater than \$100. You are better off waiting for the future sum.

Notice that the answer to our question depends on the interest rate. If the interest rate were 8 percent, then the \$200 in 10 years would have a present value of  $\$200/(1.08)^{10}$ , which is only \$93. In this case, you should take the \$100 today. Why should the interest rate matter for your choice? The answer is that the higher the interest rate, the more you can earn by depositing your money in a bank, so the more attractive getting \$100 today becomes.

The concept of present value is useful in many applications, including the decisions that companies face when evaluating investment projects. For instance, imagine that General Motors is thinking about building a new factory. Suppose that the factory will cost \$100 million today and will yield the company \$200 million in 10 years. Should General Motors undertake the project? You can see that this decision is exactly like the one we have been studying. To make its decision, the company should compare the present value of the \$200 million return to the \$100 million cost.

The company's decision, therefore, will depend on the interest rate. If the interest rate is 5 percent, then the present value of the \$200 million return from the factory is \$123 million, and the company will choose to pay the \$100 million cost. By contrast, if the interest rate is 8 percent, then the present value of the return is only \$93 million, and the company will decide to forgo the project. Thus, the concept of present value helps explain why investment—and thus the quantity of loanable funds demanded—declines when the interest rate rises.

Here is another application of present value: Suppose you win a million-dollar lottery and are given a choice between \$20,000 a year for 50 years (totaling \$1,000,000) or an immediate payment of \$400,000. Which would you choose? To make the right choice, you need to calculate the present value of the stream of payments. Let's suppose the interest rate is 7 percent. After performing 50 calculations similar to those above (one calculation for each payment) and adding up the results, you would learn that the present value of this million-dollar prize at a 7 percent interest rate is only \$276,000. You are better off picking the immediate payment of \$400,000. The million dollars may seem like more money, but the future cash flows, once discounted to the present, are worth far less.

**FYI**

## The Magic of Compounding and the Rule of 70

Suppose you observe that one country has an average growth rate of 1 percent per year, while another has an average growth rate of 3 percent per year. At first, this gap might not seem like a big deal. What difference can 2 percent make?

The answer is: a big difference. Growth rates that seem small when written in percentage terms are large after they are compounded for many years.

Consider an example. Suppose that two college graduates—Elliot and Darlene—both take their first jobs at the age of 22 earning \$30,000 a year. Elliot lives in an economy where all incomes grow at 1 percent per year, while Darlene lives in one where incomes grow at 3 percent per year. Straightforward calculations show what happens. Forty years later, when both are 62 years old, Elliot earns \$45,000 a year, while Darlene earns \$98,000. Because of that difference of 2 percentage points in the growth rate, Darlene's salary is more than twice Elliot's.

An old rule of thumb, called the *rule of 70*, is helpful in understanding growth rates and the effects of compounding. According to the rule of 70, if some amount grows at a rate of  $x$  percent per year, then that amount

doubles in approximately  $70/x$  years. In Elliot's economy, incomes grow at 1 percent per year, so it takes about 70 years for incomes to double. In Darlene's economy, incomes grow at 3 percent per year, so it takes about  $70/3$ , or 23, years for incomes to double.

The rule of 70 applies not only to a growing economy but also to a growing savings account. Here is an example: In 1791, Ben Franklin died and left \$5,000 to be invested for a period of 200 years to benefit medical students and scientific research. If this money had earned 7 percent per year (which would, in fact, have been possible), the investment would have doubled in value every 10 years. Over 200 years, it would have doubled 20 times. At the end of 200 years of compounding, the investment would have been worth  $2^{20} \times \$5,000$ , which is about \$5 billion. (In fact, Franklin's \$5,000 grew to only \$2 million over 200 years because some of the money was spent along the way.)

As these examples show, growth rates and interest rates compounded over many years can lead to some spectacular results. That is probably why Albert Einstein once called compounding “the greatest mathematical discovery of all time.” ■

### QuickQuiz

1. If the interest rate is zero, then \$100 to be paid in 10 years has a present value that is
  - a. less than \$100.
  - b. exactly \$100.
  - c. more than \$100.
  - d. indeterminate.
2. If the interest rate is 10 percent, then the future value in 2 years of \$100 today is
  - a. \$80.
  - b. \$83.
  - c. \$120.
  - d. \$121.
3. If the interest rate is 10 percent, then the present value of \$100 to be paid in 2 years is
  - a. \$80.
  - b. \$83.
  - c. \$120.
  - d. \$121.

*Answers at end of chapter.*

## 27-2 Managing Risk

Life is full of gambles. When you go skiing, you risk breaking your leg in a fall. When you drive to work, you risk getting into a car accident. When you put some of your savings in the stock market, you risk losing your money from a fall in stock prices. The rational response to risk is not to avoid it at any cost but to take it into account in your decision making. Let's consider how you might do that as you make financial decisions.

## 27-2a Risk Aversion

Most people are **risk averse**. This means more than that people dislike bad things happening to them. It means that they dislike bad things more than they like comparable good things.

For example, suppose a friend offers you the following deal. She will toss a coin. If it comes up heads, she will pay you \$1,000. But if it comes up tails, you will have to pay her \$1,000. Would you accept the bargain? You wouldn't if you were risk averse. For a risk-averse person, the pain of losing the \$1,000 would exceed the pleasure from winning \$1,000.

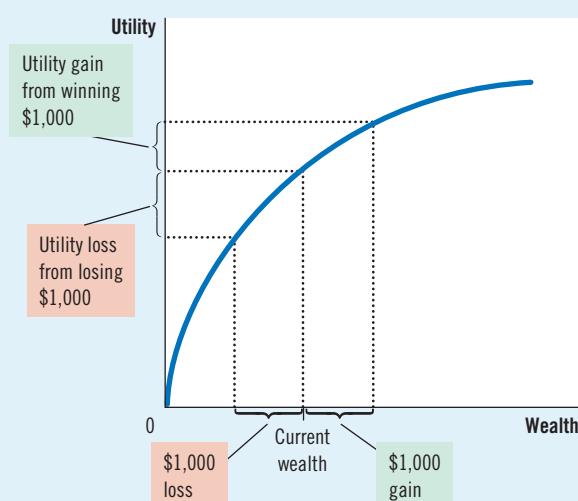
Economists have developed models of risk aversion using the concept of *utility*, which is a person's subjective measure of well-being or satisfaction. As the utility function in Figure 1 shows, every level of wealth provides a certain amount of utility. But the utility function gets flatter as wealth increases, meaning it exhibits the property of diminishing marginal utility: The more wealth a person has, the less utility she gets from an additional dollar. Because of diminishing marginal utility, the utility forfeited from losing the \$1,000 bet exceeds the utility gained from winning it. In other words, diminishing marginal utility is the reason most people are risk averse.

Risk aversion provides the starting point for explaining various things we observe in the economy. Let's consider three of them: insurance, diversification, and the risk-return trade-off.

## 27-2b The Markets for Insurance

One way to deal with risk is to buy insurance. The general feature of insurance contracts is that a person facing a risk pays a fee to an insurance company, which in return agrees to accept all or part of the risk. There are many types of insurance. Car insurance covers the risk of you getting into an auto accident, fire insurance covers the risk of your house burning down, health insurance covers the risk of you needing expensive medical treatment, and life insurance covers the risk of you dying and leaving your family without your income. There is also insurance against the risk of living too long: For a fee paid today, an insurance company will pay you an *annuity*—a regular income every year until you die.

**risk aversion**  
a dislike of uncertainty



**FIGURE 1**

### The Utility Function

This utility function shows how utility, a subjective measure of satisfaction, depends on wealth. As wealth rises, the utility function becomes flatter, reflecting the property of diminishing marginal utility. Because of diminishing marginal utility, a \$1,000 loss decreases utility by more than a \$1,000 gain increases it.

In a sense, every insurance contract is a gamble. It is possible that you will not be in an auto accident, that your house will not burn down, and that you will not need expensive medical treatment. In most years, you will pay the insurance company the premium and get nothing in return except peace of mind. Indeed, the insurance company is counting on the fact that most people will not make claims on their policies; otherwise, it couldn't pay out large claims to the unlucky few and still stay in business.

From the standpoint of the economy as a whole, the role of insurance is not to eliminate the risks inherent in life but to spread them around more efficiently. Consider fire insurance, for instance. Owning fire insurance does not reduce the risk of losing your home in a fire. But if that unlucky event occurs, the insurance company compensates you. The risk, rather than being borne by you alone, is shared among the thousands of insurance-company shareholders. Because people are risk averse, it is easier for 10,000 people to bear 1/10,000 of the risk than for one person to bear the entire risk herself.

The markets for insurance suffer from two types of problems that impede their ability to spread risk. One problem is *adverse selection*: A high-risk person is more likely to apply for insurance than a low-risk person because a high-risk person would benefit more from insurance protection. A second problem is *moral hazard*: After people buy insurance, they have less incentive to be careful about their risky behavior because the insurance company will cover much of the resulting losses. Insurance companies are aware of these problems, but they cannot fully guard against them. An insurance company cannot perfectly distinguish between high-risk and low-risk customers, and it cannot monitor all of its customers' risky behavior. The price of insurance reflects the actual risks that the insurance company will face after the insurance is bought. The high price of insurance is why some people, especially those who know themselves to be low-risk, decide against buying it and, instead, endure some of life's uncertainty on their own.

### 27-2c Diversification of Firm-Specific Risk

In 2001, Enron, a large and once widely respected company, went bankrupt amid accusations of fraud and accounting irregularities. Several of the company's top executives were prosecuted and ended up going to prison. The saddest part of the story, however, involved Enron's thousands of lower-level employees. Not only did they lose their jobs but many lost their life savings as well. The employees had put about two-thirds of their retirement funds in Enron stock, which became worthless.

If there is one piece of practical advice that finance offers risk-averse people, it is the following: "Don't put all your eggs in one basket." You may have heard this folk wisdom before, but finance has turned it into a science. It is called **diversification**.

The market for insurance is one example of diversification. Imagine a town with 10,000 homeowners, each facing the risk of a house fire. If someone starts an insurance company and each person in town becomes both a shareholder and a policyholder of the company, they all reduce their risk through diversification. Each person now faces 1/10,000 of the risk of 10,000 possible fires, rather than the entire risk of a single fire in her own home. Unless the entire town catches fire at the same time, the downside that each person faces is much smaller.

When people use their savings to buy financial assets, they can also reduce risk through diversification. A person who buys stock in a company is placing a bet on the future profitability of that company. That bet is often risky because it is hard to predict the fortunes of any single company. Microsoft evolved from a start-up by some geeky teenagers into one of the world's most valuable companies in only

#### **diversification**

the reduction of risk achieved by replacing a single risk with a large number of smaller, unrelated risks

a few years; Enron went from one of the world's most respected companies to an almost worthless one in only a few months. Fortunately, a shareholder need not tie her own fortune to that of any single company. Risk can be reduced by placing a large number of small bets, rather than a small number of large ones.

Figure 2 shows how the risk of a portfolio of stocks depends on the number of stocks in the portfolio. Risk is measured here by a statistic called the *standard deviation*, which may be familiar to you from a math or statistics class. The standard deviation measures the volatility of a variable—that is, how much the variable is likely to fluctuate. The higher the standard deviation of a portfolio's return, the more volatile its return is likely to be, and the riskier it is that someone holding the portfolio will fail to get the return that she expected.

The figure shows that the risk of a stock portfolio falls substantially as the number of stocks increases. For a portfolio with a single stock, the standard deviation is 49 percent. Going from 1 stock to 10 stocks eliminates about half the risk. Going from 10 stocks to 20 stocks reduces the risk by another 10 percent. As the number of stocks continues to increase, risk continues to fall, although the reductions in risk beyond 20 to 30 stocks are small.

Notice that it is impossible to eliminate all risk by increasing the number of stocks in the portfolio. Diversification can eliminate **firm-specific risk**—the uncertainty associated with a specific company. But diversification cannot eliminate **market risk**—the uncertainty associated with the entire economy, which affects all companies traded on the stock market. For example, when the economy goes into a recession, most companies experience falling sales, reduced profit, and lower stock returns. Diversification reduces the risk of holding stocks, but it does not eliminate it.

## 27-2d The Trade-Off between Risk and Return

One of the *Ten Principles of Economics* in Chapter 1 is that people face trade-offs. The trade-off that is most relevant for understanding financial decisions is the trade-off between risk and return.

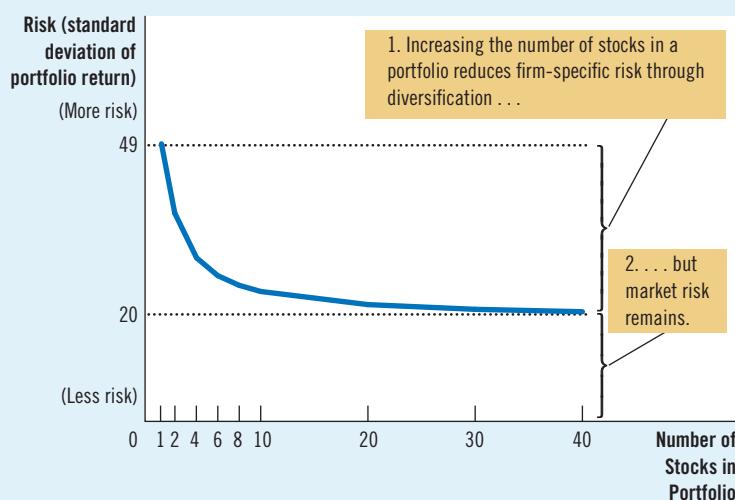
As we have seen, there are risks inherent in holding stocks, even in a diversified portfolio. But risk-averse people are willing to accept this uncertainty because they

### **firm-specific risk**

risk that affects only a single company

### **market risk**

risk that affects all companies in the stock market



**FIGURE 2**

### Diversification Reduces Risk

This figure shows how the risk of a portfolio, measured here by a statistic called the *standard deviation*, depends on the number of stocks in the portfolio. The investor is assumed to put an equal percentage of her portfolio in each of the stocks. Increasing the number of stocks reduces but does not eliminate the risk in a stock portfolio.

Source: Adapted from Meir Statman, "How Many Stocks Make a Diversified Portfolio?" *Journal of Financial and Quantitative Analysis* 22 (September 1987): 353–364.

are compensated for doing so. Historically, stocks have offered much higher rates of return than alternative financial assets, such as bonds and bank savings accounts. Over the past two centuries, stocks have generated an average real return of about 8 percent per year, while short-term government bonds have paid a real return of only 3 percent per year.

When deciding how to allocate their savings, people have to decide how much risk they are willing to undertake to earn a higher return. For example, consider a person choosing how to allocate her portfolio between two asset classes:

- The first asset class is a diversified group of risky stocks offering an average return of 8 percent and a standard deviation of 20 percent. You may recall from a math or statistics class that a normal random variable stays within 2 standard deviations of its average about 95 percent of the time. Here, 2 standard deviations mean fluctuations of  $\pm 40$  percent. Thus, while returns are centered around 8 percent, they vary between a 48 percent gain to a 32 percent loss 95 percent of the time.
- The second asset class is a safe alternative, with a return of 3 percent and a standard deviation of zero. That is, this asset always pays exactly 3 percent. The safe alternative can be either a bank savings account or a government bond.

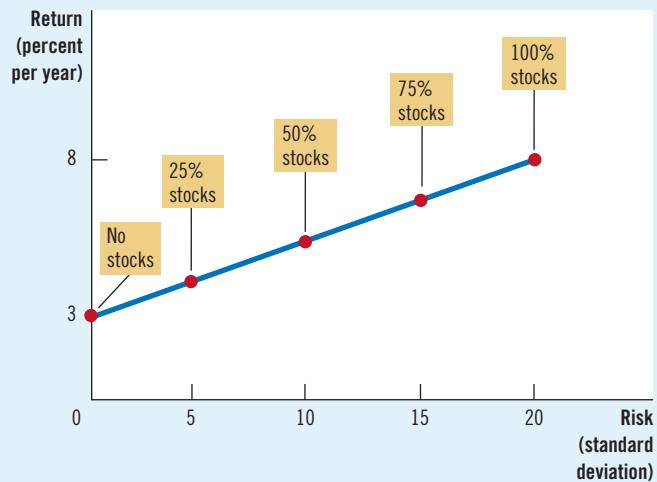
Figure 3 illustrates the trade-off between risk and return. Each point in this figure represents a particular allocation of a portfolio between risky stocks and the safe asset. The figure shows that the more the individual puts into stocks, the greater both the risk and the return are.

Acknowledging the risk-return trade-off does not, by itself, tell us what a person should do. The choice of a particular combination of risk and return depends on a person's risk aversion, which reflects her own preferences. But it is important for stockholders to recognize that the higher average return that they enjoy comes at the price of higher risk.

**FIGURE 3**

#### The Trade-Off between Risk and Return

When people increase the percentage of their savings that they have invested in stocks, they increase the average return they can expect to earn, but they also increase the risks they face.



### QuickQuiz

4. The ability of insurance to spread risk is limited by
  - a. risk aversion and moral hazard.
  - b. risk aversion and adverse selection.
  - c. moral hazard and adverse selection.
  - d. risk aversion only.
5. The benefit of diversification when constructing a portfolio is that it can eliminate
  - a. adverse selection.
  - b. risk aversion.
  - c. firm-specific risk.
  - d. market risk.
6. The extra return that stocks earn over bonds (on average) compensates stockholders for
  - a. the greater market risk that stockholding entails.
  - b. the greater firm-specific risk that stockholding entails.
  - c. the higher taxes levied on stockholders.
  - d. the higher brokerage costs incurred buying stocks.

*Answers at end of chapter.*

## 27-3 Asset Valuation

Now that we have developed a basic understanding of the two building blocks of finance—time and risk—let’s apply this knowledge. This section considers a simple question: What determines the price of a share of stock? As for most prices, the answer is supply and demand. But that is not the end of the story. To understand stock prices, we need to think more deeply about what determines a person’s willingness to pay for a share of stock.

### 27-3a Fundamental Analysis

Let’s imagine that you have decided to put 60 percent of your savings into stock and that, to achieve diversification, you have decided to buy 20 different stocks. If you open up the newspaper, you will find thousands of stocks listed. How should you pick the 20 for your portfolio?

When you buy stock, you are buying shares in a business. To decide which businesses you want to own, it is natural to consider two things: the value of that share of the business and the price at which the shares are being sold. If the price is more than the value, the stock is said to be *overvalued*. If the price and the value are equal, the stock is said to be *fairly valued*. And if the price is less than the value, the stock is said to be *undervalued*. Undervalued stocks are a bargain because you pay less than the business is worth. When choosing 20 stocks for your portfolio, you should look for undervalued stocks.

But that is easier said than done. Learning the price of the company’s stock is easy: You can just look it up. Determining the value of the company is the hard part. The term **fundamental analysis** refers to the detailed analysis of a company in order to estimate its value. Many Wall Street firms hire stock analysts to conduct such fundamental analysis and offer advice about which stocks to buy.

The value of a stock to a stockholder is what she gets out of owning it, which includes the present value of the stream of dividend payments and the final sale price. Recall that *dividends* are the cash payments that a company makes to its shareholders. A company’s ability to pay dividends, as well as the value of the stock when the stockholder sells her shares, depends on the company’s ability to earn profits. Its profitability, in turn, depends on a large number of factors: the demand for its product, the amount and kinds of capital it has in place, the degree of competition it confronts, the extent of unionization of its workers, the loyalty of

**fundamental analysis**  
the study of a company’s accounting statements and future prospects to determine its value

**FYI**

## Key Numbers for Stock Watchers

When following the stock of a company, you should keep an eye on three key numbers. These numbers are reported on the financial pages of some newspapers, and you can easily obtain them online as well (such as at Yahoo! Finance):

- **Price.** The single most important piece of information about a stock is the price of a share. News services usually present several prices. The “last” price is the price at which the stock more recently traded. The “previous close” is the price of the last transaction that occurred before the stock exchange closed on its previous day of trading. A news service may also give the “high” and “low” prices over the past day of trading and, sometimes, over the past year as well. It may also report the change from the previous day’s closing price.
- **Dividend.** Corporations pay out some of their profits to their stockholders; this amount is called the *dividend*. (Profits not paid out are called *retained earnings* and are used by the corporation for additional investment.) News services often report the dividend paid over the previous year for each share of stock. They sometimes report the *dividend yield*, which is the dividend expressed as a percentage of the stock’s price.

- **Price-earnings ratio.** A corporation’s earnings, or accounting profit, is the amount of revenue it receives for the sale of its products minus its costs of production as measured by its accountants. *Earnings per share* is the company’s total earnings divided by the number of shares of stock outstanding. The *price-earnings ratio*, often called the P/E, is the price of one share of a corporation’s stock divided by the corporation’s earnings per share over the past year. Historically, the typical price-earnings ratio has been about 15. A high P/E indicates that a corporation’s stock is expensive relative to its recent earnings, suggesting either that people expect earnings to rise in the future or that the stock is overvalued. Conversely, a low P/E indicates that a corporation’s stock is cheap relative to its recent earnings, suggesting either that people expect earnings to fall or that the stock is undervalued.

Why do news services report all these data? Many people who invest their savings in stock follow these numbers closely when deciding which stocks to buy and sell. By contrast, other stockholders follow a buy-and-hold strategy: They buy the stock of well-run companies, hold it for long periods of time, and do not respond to daily fluctuations. ■

its customers, the government regulations and taxes it faces, and so on. The goal of fundamental analysis is to take all these factors into account to determine how much a share of stock in the company is worth.

If you want to rely on fundamental analysis to pick a stock portfolio, there are three ways to do it. One way is to do all the necessary research yourself by, for instance, reading through companies’ annual reports. A second way is to rely on the advice of Wall Street analysts. A third way is to buy shares in a mutual fund, which has a manager who conducts fundamental analysis and makes decisions for you.

### 27-3b The Efficient Markets Hypothesis

There is another way to choose 20 stocks for your portfolio: Pick them randomly by, for instance, putting the stock pages on your bulletin board and throwing darts at them. This approach may sound crazy, but there is reason to believe that it won’t lead you too far astray. That reason is called the **efficient markets hypothesis**.

To understand this theory, the starting point is to realize that each company listed on a major stock exchange is followed closely by many money managers, such as the individuals who run mutual funds. Every day, these managers monitor news stories and conduct fundamental analysis to try to determine a stock’s value. Their job is to buy a stock when its price falls below its fundamental value and to sell it when its price rises above its fundamental value.

The second piece to the efficient markets hypothesis is that the equilibrium of supply and demand sets the market price. This means that, at the market price, the number of shares being offered for sale exactly equals the number of shares that people want to buy. In other words, at the market price, the number of people who

#### **efficient markets hypothesis**

the theory that asset prices reflect all publicly available information about the value of an asset

think the stock is overvalued exactly balances the number of people who think it's undervalued. As judged by the typical person in the market, all stocks are fairly valued all the time.

According to this theory, the stock market exhibits **informational efficiency**: It reflects all available information about the value of an asset. Stock prices change when information changes. When good news about a company's prospects becomes public, the company's value and stock price both rise. When a company's prospects deteriorate, its value and price both fall. But at any moment in time, the market price is the best guess of the company's value based on available information.

One implication of the efficient markets hypothesis is that stock prices should follow a **random walk**, meaning that changes in stock prices should be impossible to predict from available information. If, based on publicly available information, a person could predict that a stock price would rise by 10 percent tomorrow, the stock market must be failing to incorporate that information today. According to the theory, the only thing that can move a company's stock price is news that changes the market's perception of the company's value. But news is inherently unpredictable—otherwise, it wouldn't really be news. As a result, changes in stock prices should be unpredictable as well.

If the efficient markets hypothesis is correct, then there is little point in spending many hours studying the business page to decide which 20 stocks to add to your portfolio. If prices reflect all available information, no stock is a better buy than any other. The best you can do is to buy a diversified portfolio.

### CASE STUDY

#### RANDOM WALKS AND INDEX FUNDS

The efficient markets hypothesis is a theory about how financial markets work. The theory may not be completely true: As we discuss in the next section, there is reason to doubt that stockholders are always rational and that stock prices are informationally efficient at every moment. Nonetheless, the efficient markets hypothesis describes the world much better than you might expect.

There is much evidence that stock prices follow, even if not exactly a random walk, something very close to it. For example, you might be tempted to buy stocks that have recently risen and avoid stocks that have recently fallen (or perhaps just the opposite). But statistical studies have shown that following such trends (or bucking them) fails to outperform the market. The correlation between how well a stock does one year and how well it does the following year is about zero.

Some of the best evidence in favor of the efficient markets hypothesis comes from the performance of index funds. An index fund is a mutual fund that buys all the stocks in a given stock index. The performance of these funds can be compared



### informational efficiency

the description of asset prices that rationally reflect all available information

### random walk

the path of a variable whose changes are impossible to predict


**ASK THE  
EXPERTS**

## Diversified Investing

"In general, absent any inside information, an equity investor can expect to do better by holding a well-diversified, low-fee, passive index fund than by holding a few stocks."

### What do economists say?



Source: IGM Economic Experts Panel, January 28, 2019.

with that of actively managed mutual funds, where a professional portfolio manager picks stocks based on extensive research and alleged expertise. In essence, index funds buy all stocks and thus offer investors the return on the average stock, whereas actively managed funds seek to buy only the best stocks and thereby outperform the market averages.

In practice, however, active managers usually fail to beat index funds. For example, in the 15-year period ending January 31, 2019, 86 percent of stock mutual funds performed worse than a broadly based index fund holding all stocks traded on U.S. stock exchanges. Over this period, the average annual return on stock funds fell short of the return on the index fund by 0.94 percentage points. Most active portfolio managers failed to beat the market because they trade more frequently, incurring more trading costs, and because they charge greater fees as compensation for their alleged expertise.

What about the 14 percent of managers who did beat the market? Perhaps they are smarter than average, or perhaps they were luckier. If you have 5,000 people flipping coins 10 times, on average about 5 will flip 10 heads; these 5 might claim an exceptional coin-flipping skill, but they would have trouble replicating the feat. Similarly, studies have shown that mutual fund managers with a history of superior performance usually fail to maintain it in subsequent periods.

The efficient markets hypothesis says that it is impossible to beat the market. The accumulation of many studies of financial markets confirms that beating the market is, at best, extremely difficult. Even if the efficient markets hypothesis is not a perfect description of the world, it contains a large element of truth. ●

### 27-3c Market Irrationality

The efficient markets hypothesis assumes that people buying and selling stock rationally process the information they have about the stock's underlying value. But are participants in the stock market really that rational? Or do stock prices sometimes deviate from reasonable expectations of their true value?

There is a long tradition suggesting that fluctuations in stock prices are partly psychological. In the 1930s, economist John Maynard Keynes suggested that asset markets are driven by the "animal spirits" of investors—irrational waves of optimism and pessimism. In the 1990s, as the stock market soared to new heights, Fed Chair Alan Greenspan questioned whether the boom reflected "irrational exuberance." Stock prices did subsequently fall, but whether the exuberance of the 1990s was irrational given the information available at the time remains debatable. Whenever the price of an asset rises above what appears to be its fundamental value, the market is said to be experiencing a *speculative bubble*.

The possibility of speculative bubbles in the stock market arises in part because the value of the stock to a stockholder depends not only on the stream of dividend payments but also on the final sale price. Thus, a person might be willing to pay more than a stock is worth today if she expects another person to pay even more for it tomorrow. When evaluating a stock, you have to estimate not only the value of the business but also what other people will think the business is worth in the future.

There is much debate among economists about the frequency and importance of departures from rational pricing. Believers in market irrationality point out (correctly) that the stock market often moves in ways that are hard to explain on the basis of news that might alter a rational valuation. Believers in the efficient markets hypothesis point out (correctly) that it is impossible to know the correct, rational

valuation of a company, so one should not quickly jump to the conclusion that any particular valuation is irrational. Moreover, if the market were irrational, a rational person should be able to take advantage of this fact and beat the market; yet as the previous case study discussed, beating the market is nearly impossible.

### QuickQuiz

7. The goal of fundamental analysis is to
  - a. determine the true value of a company.
  - b. put together a diversified portfolio.
  - c. predict changes in investor irrationality.
  - d. eliminate investor risk aversion.
8. According to the efficient markets hypothesis,
  - a. excessive diversification can reduce an investor's expected portfolio returns.
  - b. changes in stock prices are impossible to predict from public information.
9. Historically, index funds have had \_\_\_\_\_ than most actively managed mutual funds.
  - a. higher fees
  - b. less diversification
  - c. larger tax burdens
  - d. better returns

*Answers at end of chapter.*

## 27-4 Conclusion

This chapter has developed some of the basic tools that people should (and often do) use as they make financial decisions. The concept of present value tells us that a dollar tomorrow is less valuable than a dollar today, and it gives us a way to compare sums of money at different points in time. The theory of risk management tells us that the future is uncertain and that risk-averse people can take precautions to guard against this uncertainty. The study of asset valuation tells us that the stock price of any company should reflect its expected future profitability.

Although most of the tools of finance are well established, there is more controversy about the validity of the efficient markets hypothesis and whether stock prices are, in reality, rational estimates of a company's true worth. Rational or not, the large movements in stock prices that we observe have important macroeconomic implications. Stock market fluctuations often go hand in hand with fluctuations in the economy more broadly. We revisit the stock market when we study economic fluctuations later in the book.

## CHAPTER IN A NUTSHELL

- Because savings can earn interest, a sum of money today is more valuable than the same sum of money in the future. A person can compare sums from different times using the concept of present value. The present value of any future sum is the amount that would be needed today, given prevailing interest rates, to produce that future sum.
- Because of diminishing marginal utility, most people are risk averse. Risk-averse people can reduce risk by buying insurance, diversifying their holdings, and choosing a portfolio with lower risk and lower return.
- The value of an asset equals the present value of the cash flows the owner will receive. For a share of stock, these cash flows include the stream of dividends and the final sale price. According to the efficient markets hypothesis, financial markets process available information rationally, so a stock price always equals the best estimate of the value of the underlying business. Some economists question the efficient markets hypothesis, however, and believe that irrational psychological factors also influence asset prices.

## KEY CONCEPTS

finance, p. 552  
 present value, p. 552  
 future value, p. 552  
 compounding, p. 552

risk aversion, p. 555  
 diversification, p. 556  
 firm-specific risk, p. 557  
 market risk, p. 557

fundamental analysis, p. 559  
 efficient markets hypothesis, p. 560  
 informational efficiency, p. 561  
 random walk, p. 561

## QUESTIONS FOR REVIEW

1. The interest rate is 7 percent. Use the concept of present value to compare \$200 to be received in 10 years and \$300 to be received in 20 years.
2. What benefit do people get from the market for insurance? What two problems impede the insurance market from working perfectly?
3. What is diversification? Does a stockholder get a greater benefit from diversification when going from 1 stock to 10 stocks or when going from 100 stocks to 120 stocks?
4. Between stocks and government bonds, which type of asset has more risk? Which pays a higher average return?
5. What factors should a stock analyst think about in determining the value of a share of stock?
6. Describe the efficient markets hypothesis, and give a piece of evidence consistent with this hypothesis.
7. Explain the view of those economists who are skeptical of the efficient markets hypothesis.

## PROBLEMS AND APPLICATIONS

1. According to an old myth, Native Americans sold the island of Manhattan about 400 years ago for \$24. If they had invested this amount at an interest rate of 7 percent per year, how much, approximately, would they have today?
2. A company has an investment project that would cost \$10 million today and yield a payoff of \$15 million in 4 years.
  - a. Should the firm undertake the project if the interest rate is 11 percent? 10 percent? 9 percent? 8 percent?
  - b. Can you figure out the exact interest rate at which the firm would be indifferent between undertaking and forgoing the project? (This interest rate is called the project's *internal rate of return*.)
3. Bond A pays \$8,000 in 20 years. Bond B pays \$8,000 in 40 years. (To keep things simple, assume that these are zero-coupon bonds, meaning the \$8,000 is the only payment the bondholder receives.)
  - a. If the interest rate is 3.5 percent, what is the value of each bond today? Which bond is worth more? Why? (*Hint:* You can use a calculator, but the rule of 70 should make the calculation easy.)
  - b. If the interest rate increases to 7 percent, what is the value of each bond? Which bond has a larger percentage change in value?
4. Based on the example above, complete the two blanks in this sentence: "The value of a bond [rises/falls] when the interest rate increases, and bonds with a longer time to maturity are [more/less] sensitive to changes in the interest rate."
5. Your bank account pays an interest rate of 8 percent. You are considering buying a share of stock in XYZ Corporation for \$110. After 1, 2, and 3 years, it will pay a dividend of \$5. You expect to sell the stock after 3 years for \$120. Is XYZ a good investment? Support your answer with calculations.
6. For each of the following kinds of insurance, give an example of behavior that reflects *moral hazard* and another example of behavior that reflects *adverse selection*.
  - a. health insurance
  - b. car insurance
  - c. life insurance
7. Which kind of stock would you expect to pay the higher average return: stock in an industry that is very sensitive to economic conditions (such as an automaker) or stock in an industry that is relatively insensitive to economic conditions (such as a water company)? Why?

7. A company faces two kinds of risk. A firm-specific risk is that a competitor might enter its market and take some of its customers. A market risk is that the economy might enter a recession, reducing sales. Which of these two risks would more likely cause the company's shareholders to demand a higher return? Why?
8. When company executives buy and sell stock based on private information that they obtain as part of their jobs, they are engaging in *insider trading*.
- Give an example of inside information that might be useful for buying or selling stock.
  - Those who trade stocks based on inside information usually earn very high rates of return. Does this fact violate the efficient markets hypothesis?
  - Insider trading is illegal. Why do you suppose that is?
9. Jamal has a utility function  $U = W^{1/2}$ , where  $W$  is his wealth in millions of dollars and  $U$  is the utility he obtains from that wealth. In the final stage of a game show, the host offers Jamal a choice between (A) \$4 million for sure and (B) a gamble that pays \$1 million with probability 0.6 and \$9 million with probability 0.4.
- Graph Jamal's utility function. Is he risk averse? Explain.
  - Does A or B offer Jamal the higher expected prize? Explain your reasoning with appropriate calculations. (*Hint:* The expected value of a random variable is the weighted average of the possible outcomes, where the probabilities are the weights.)
  - Does A or B offer Jamal the higher expected utility? Again, show your calculations.
  - Should Jamal pick A or B? Why?

### QuickQuiz Answers

1. b    2. d    3. b    4. c    5. c    6. a    7. a    8. b    9. d